

Behavioral Dentistry

**David I. Mostofsky
Farida Fortune**



2nd Edition

WILEY Blackwell



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Second Edition

Edited by

David I. Mostofsky and Farida Fortune

WILEY Blackwell

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Contents

	Contributors	ix
	Foreword	xiii
	<i>Henrietta L. Logan</i>	
	Preface	xv
	<i>David I. Mostofsky and Farida Fortune</i>	
Part I	Biobehavioral Processes	1
1	Cultural Issues in Dental Education	3
	<i>Vishal R. Aggarwal and Farida Fortune</i>	
2	Oral Health and Quality of Life	11
	<i>Marita R. Inglehart</i>	
3	Stress and Inflammation	27
	<i>Annsofi Johannsen and Anders Gustafsson</i>	
4	Saliva in Health and Disease	37
	<i>Mahvash Navazesh</i>	
5	Surface EMG Biofeedback in Assessment and Functional Muscle Reeducation	49
	<i>Bruce Mehler</i>	

6	Hypnosis in Dentistry <i>Bruce Peltier</i>	75
Part II	Anxiety, Fear, and Pain	87
7	Environmental, Emotional, and Cognitive Determinants of Dental Pain <i>Daniel W. McNeil, Alison M. Vargovich, John T. Sorrell, and Kevin E. Vowles</i>	89
8	Cosmetic Dentistry: Concerns with Facial Appearance and Body Dysmorphic Disorder <i>Ad De Jongh</i>	109
9	Chronic Orofacial Pain: Biobehavioral Perspectives <i>Samuel F. Dworkin and Richard Ohrbach</i>	121
10	Chairside Techniques for Reducing Dental Fear <i>Ronald W. Botto, Evelyn Donate-Bartfield, and Patricia Nihill</i>	141
11	Sleep and Awake Bruxism <i>Alan G. Glaros and Cody Hanson</i>	153
12	Dental Fear and Anxiety Associated with Oral Health Care: Conceptual and Clinical Issues <i>Daniel W. McNeil and Cameron L. Randall</i>	165
Part III	Changing Behaviors	193
13	Behavior Management in Dentistry: Thumb Sucking <i>Raymond G. Miltenberger and John T. Rapp</i>	195
14	Management of Children's Distress and Disruptions during Dental Treatment <i>Keith D. Allen and Dustin P. Wallace</i>	209
15	Stress, Coping, and Periodontal Disease <i>Gernot Wimmer and Walther Wegscheider</i>	227
16	Self-Efficacy Perceptions in Oral Health Behavior <i>Anna-Maija Syrjälä</i>	237
17	Drooling and Tongue Protrusion <i>Jan J. W. Van der Burg, Robert Didden, and Giulio E. Lancioni</i>	251
Part IV	Professional Practice	265
18	Listening <i>Bruce Peltier</i>	267
19	Interpersonal Communication Training in Dental Education <i>Toshiko Yoshida and Kazuhiko Fujisaki</i>	283

20	Biopsychosocial Considerations in Geriatric Dentistry <i>Georgia Dounis and David Cappelli</i>	293
21	Health Behavior and Dental Care of Diabetics <i>Mirka C. Niskanen and Matti L. E. Knuuttila</i>	323
22	Oral Health Promotion with People with Special Needs <i>Paul Glassman</i>	337
23	The Use of Humor in Pediatric Dentistry <i>Ari Kupietzky and Joseph Shapira</i>	349
24	Work Stress, Burnout Risk, and Engagement in Dental Practice <i>Ronald C. Gorter</i>	363
25	Role of Dentists as Oral Physicians in Physical and Mental Health <i>Donald B. Giddon and Ruth Hertzman-Miller</i>	373
	Appendix Brief Relaxation Training Procedure for Use in Dentistry <i>Ronald W. Botto</i>	389
	Index	397

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Foreword

The view of health has changed dramatically in the past decades from a mechanistic view to recognition of the integrative nature of human biology, physiology, behavior, and genetics. The first edition of this book included cutting-edge science by some of the most important researchers of the day. Clearly, the methods and findings reported in the first edition added considerably to the understanding of behavior management as an important element of any dental practice. The second edition you hold in your hands reflects new information about behavior and dentistry and recasts long-established principles in a contemporary context. This book is a must-read for any dentist or dental team member who has been puzzled by a patient's dental behavior.

Most oral diseases are preventable, but to prevent them, we must broaden our understanding of human behavior and the socio-ecological milieu in which they occur. Recently, changes enacted in healthcare funding affirm the essential connection between oral and overall health

and expand access to care for millions of children and adults. As you read this book, contextualize the problems of achieving oral health for this diverse group within a broader geopolitical framework. Many of the least served among these diverse groups occupy an interplay of identities which further disadvantages them. For instance, being from a rural region is often equal to fewer healthcare services being available locally. Being poor is equivalent to having fewer resources to spend on seeking dental care. Thus, those who are both poor and rural form a subgroup with particular challenges in achieving or maintaining oral health. Water sources (often locally owned wells) are not fluoridated, and the purchase of toothbrushes and toothpaste on food subsidies is problematic.

Contextual issues arising from the greater diversity within a dentist's patient pool are brought to the fore in the chapter on "Listening." Dr. Peltier notes that patients have theories about what caused their oral health problems based on the cultural milieu in which

they live. Effective treatment and education of the patient must take those theories into consideration. Using the evidence-based communication strategies outlined in Chapter 23 is an important first step in identifying those “theories” and tailoring treatment and instruction to that patient. The ensuing education can correct the myths and beliefs that drove the patient’s deleterious behavior and foster changes that can sustain oral health.

Scientific evidence shows that many chronic diseases, including oral diseases, share common processes and related risk factors. We also have undeniable evidence that behavior plays a central role in disease development. It is also well recognized that there are complex social and contextual factors that influence behavior. The dentist must be aware of these issues to effectively care for patients. The deepening appreciation and understanding of the relationship of oral health and general health from a reductionist perspective has elevated concern at the holistic level about how health-preserving behaviors can be fostered. The chapter on diabetes in this second edition superbly frames the challenge dentists face in both behaviorally and medically managing the dental problems of the ever-growing group of patients. Several plausible biological mechanisms for the link between diabetes and oral disease are presented with practical recommendations for communicating with patients about the link between their disease and oral health. Techniques for producing behavior change among these patients are front and center in this chapter. These tech-

niques will be of value for most dental teams caring for older patients with chronic diseases and comorbid conditions.

The second edition also includes practical material related to multiculturalism. In Chapter 20 (Biopsychosocial Considerations in Geriatric Dentistry), the reader is guided to recognize that culture and literacy play a pivotal role in disease progression among older patients. The focus of this chapter is on the biopsychosocial challenges of treating older adults. The authors have done an exceptional job of identifying the multiple determinants of oral health and integrating these ideas into a practical guide for the dental team.

Throughout the book, the knowledge so eloquently presented by the nearly three dozen contributors identifies strategies for expanding and deepening the well-studied traditional interventions to a more racially and culturally diverse citizenry being seen in contemporary dental practices. These authors have done a masterful job of adopting an integrative perspective from which patients’ health behavior practices can be influenced and sustainable oral health can be achieved. The editors are to be congratulated for bringing together a group of authors whose chapters collectively form a comprehensive view of behavioral dentistry.

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Preface

The first edition of *Behavioral Dentistry* has been very well accepted. It has gone through several printings since its original publication in 2006. This has been most gratifying, and it encouraged us to undertake a second edition with new and updated material that would be similarly welcomed as an important contribution to dental education.

There was never a serious consideration that the oft-quoted witty definition of dental practice could be axiomatically defined by three words: drill, fill, and bill. Dental professionals have long been aware that the person receiving their dental services is likely to confront a variety of emotional and sensory experiences, and to cope with these situations by invoking numerous behaviors that had been learned in the past. Acceptance, distraction, relaxation, and acquired skills for pain tolerance and discomfort are but some of the complex dynamics that accompany the patient sitting in the chair. Dental education has always been alert to the importance to accommodate the special needs,

personality, and psychological profile of the patient in order to maximize the benefits provided by a trained dental professional. In addition to dealing with the obvious considerations that must be taken into account for pediatric, geriatric, and special needs patients, different, but hardly unique, challenges routinely require resolution. Dealing with anxiety, phobia, and compliance are some of the issues that dental education highlights during training, and that are regularly updated in continuing education sessions. However, for too long, the discussion of such issues that have been taught under the umbrella of Human Behavior or Behavior Science have neither been fully accepted nor particularly appreciated by the student. Similarly, the experienced dental professional often places little value on enhancing the acquisition of new skills, conceptual learning, and professional style from lectures on human behavior or behavior science.

In the preface to the first edition of this volume, we acknowledged that the importance

of Social Science has been duly recognized in the world of the dentist. Indeed, this is reflected in the curriculum and accreditation requirements for dental schools. The social sciences and psychology, in particular, had much to say about the dynamics of applied dental medicine. In the more recent past, a more mature and refined body of psychological theory and technology has become available for specific applications to health professions. The emergence of Behavioral Medicine as an interdisciplinary collaboration within health science and practice provides its distinct flavor of adapting nonmedication and nonsurgical options for use in interventions and treatment. Derived as it is on empirical-based research, it is quite natural to extend to dentistry the advances that have already proven themselves in other areas of medicine and health. For the frontline clinician, it reflects the advantages that derive from translational research. For the practicing dentist and dental professional, as well as for the psychologist and others with an interest in dental medicine, the opportunities for effectively managing many potentially troubling anxieties will be highly appreciated. In addition, the problems associated with managing the difficult patient, designing community programs for establishing and maintaining oral health practice, and implementing optimal dental training curricula are among the common concerns that continue to deserve attention. Less familiar to many in the dental community is an appreciation of the importance of some of the existing techniques in behavioral medicine, such as behavior modification, biofeedback, and hypnosis, which may be applied to the practice of dentistry. We do not claim that this volume will provide a definitive or encyclopedic account for each of the separate topics. We do, however, hope that the book will provide an entry to a body of impressive literature on Behavioral Dentistry which will motivate the serious reader and student to consider the implications of the volume as he/she

proceeds in a dental career, and will offer practical solutions that can be implemented without burdensome cost or effort to both the dental team and the patient.

The contributors to this volume comprise a roster of international experts in many of the subspecialties that define Behavioral Dentistry, and many of our authors serve in leadership roles in national dental organizations and societies. This edition of *Behavioral Dentistry* follows in the general style and topical coverage that was adopted in the earlier version, although we added some chapters and authors that were not previously included. Yet, as we welcome a number of new chapters and new contributors, we acknowledge those who do not appear in this edition. We are especially grateful to psychologist and dentist Donald Giddon, who, while no longer having the responsibilities of a coeditor of *Behavioral Dentistry*, continues to enjoy a highly visible and prestigious reputation in the psychosocial aspects of dentistry. His commitment and passion for promoting an expanded role for dentists as oral physicians, who are able to provide limited preventative primary care for both mental and physical health, are also well-known and respected by his colleagues in behavioral medicine and dentistry. We acknowledge the valuable assistance of Ms. Paula Carey and Ms. Mary Foppiani, the science librarians at Boston University, in helping to bring this project to fruition.

Although we attempted to cast a wide net and present a range of issues and techniques that can be expected from a closer union with behavior sciences, we were not able to include many important topics or invite a number of prominent experts to discuss their work because of page restrictions. It is our hope that succeeding editions will enable us to approach that goal with success.

David I. Mostofsky
Farida Fortune

Biobehavioral Processes



Cultural Issues in Dental Education

Vishal R. Aggarwal and Farida Fortune

Key points

- Populations are becoming increasingly heterogeneous, migrating longer distances, and bringing with them different cultural expectations and needs.
- The cultural heterogeneity impacts on the management of oro-dental diseases, including etiological risk factors (related to harmful lifestyle habits) through behavioral differences displayed by patients from different cultures.
- Training a dental workforce that is culturally and linguistically competent and that values the behavioral and psychosocial needs of multicultural populations is important.
- A dental workforce that will not only have the potential to reduce oral health inequalities, but also to deliver any communication, training, and clinical management with understanding, respect, and dignity needs to be developed.

Incorporating Culture into Dentistry

The word “culture” has several meanings. The two most relevant to dental education that can be considered is “development or improvement of the mind by education or training” and “the behaviors and beliefs characteristic of a particular social, ethnic, or age group” (Dictionary.com). These definitions of culture have direct implications in dentistry and are being incorporated into undergraduate curricula internationally. The American Dental Education Association (ADEA) has prompted the need to train culturally competent graduates to tackle widening oral health inequalities in the United States (Haden et al., 2003). Similarly in the UK, the General Dental Council (General Dental Council, UK, 2008) stipulates that UK graduates should

- have knowledge of managing patients from different social and ethnic backgrounds
- be familiar with the social, cultural, and environmental factors which contribute to health or illness
- be familiar with social and psychological issues relevant to the care of patients.

These are aspects of culture related to oral health and those directly relevant to patients. The General Dental Council and ADEA take this further and extends it into professional development, further stipulating that graduates should have “respect for patients and colleagues that encompasses, without prejudice, diversity of background and opportunity, language and culture” (Haden et al., 2003; General Dental Council, UK, 2008). Consequently, cultural issues in dentistry not only impact and include clinical care of patients, but also aspects of interaction between students and staff of different social and ethnicity backgrounds.

Given these requirements, dental institutions have a responsibility to introduce these elements into their training programs. Indeed, the word social responsibility has become de rigeur

in professional development. In its broadest sense, social responsibility is “the obligation of an organization’s management towards the welfare and interests of the society in which it operates” (Business Dictionary.com). The key objectives of this chapter will therefore be to focus on the impact and need of introducing culture and social responsibility into dental education using three main viewpoints related to the following.

- *Impact of Culture on Patient Management:* Impact of presence of dental institutions on the oral health of patients within migrating populations and multicultural communities.
- *The Need for a Culturally Diverse Teaching Staff and Dental Training Courses:* Ability of dental education to address the needs of culturally diverse dental student communities.
- *The Need for a Culturally Balanced Academic Environment:* Ability to impact on both clinical and societal teaching and learning and on recruitment and interview process for students.

Impact of Culture on Patient Management

Migration always carries serious risks for both human rights and health. As the global population becomes more mobile and more people travel greater distances, societies are becoming more culturally and socially complex. This in turn creates the requirement for new changes in public health, and consequently, for both clinical medical and dental delivery. The UN estimates that migrant populations total about 290 million (Carballo & Nerukar, 2001). However, it fails to account for rural–urban, irregular, circular, and seasonal migration, as well as trafficked women and children. The figure is probably closer to 1 billion (Carballo & Nerukar, 2001). Such populations carry with them the major challenge of integrating into new countries and communities, which has a major impact on their

healthcare provision and access to services. They are known to have higher levels of communicable and noncommunicable diseases (including dental disease), given their exposure to behavioral, environmental, and occupational risk factors. It is these social determinants of health that are major causes of the observed inequalities associated with oral health that are prevalent among migrating populations (WHO Commission for Social Determinants of Health, 2008). Yet dental healthcare services do little to comprehend these complex factors that can influence compliance and adherence to both preventive and therapeutic programs for oral diseases. The current dental healthcare system needs to be alert to the fact that its populations are becoming increasingly heterogeneous, migrating longer distances and bringing with them different profiles and needs. These groups usually become increasingly marginalized and have poorer outcomes for oral health. This in turn has a broader impact on dental public health (WHO Commission for Social Determinants of Health, 2008). Current reports (Marmot, 2010; Fuller et al., 2011) suggest that although overall oral health of populations is improving, oral health inequalities are worsening. Despite this, training in dental schools tends to follow a very biomedical approach of “diagnose-treat-cure.” This tends to focus on the mouth or individuals’ teeth rather than the person as a whole. Many issues faced by migrants and those from ethnic minority backgrounds are psychosocial and need a deeper understanding of their social history and culture. A lack of understanding of these psychosocial and cultural behaviors can adversely affect clinical care of such patients. Dental anxiety and phobia is a strong predictor of postoperative pain following dental procedures rather than the procedure itself (Tickle et al., 2012). This is an indication of how psychosocial factors can influence postoperative pain, and an empathetic approach to patients is important prior to undertaking dental procedures. Awareness of the range of behaviors that are associated with cultural differences should be an important component of undergraduate

dental education. Such awareness will also allow an understanding of how these complex behaviors can be targeted to alleviate dental anxiety and phobia. This will not only influence compliance and adherence to operative procedures, but also preventive and therapeutic programs for oral diseases.

It is also important for dental professionals to appreciate how psychosocial factors can themselves influence the onset and persistence of chronic dental diseases. The classical example of this includes chronic orofacial pain conditions like temporomandibular pain and persistent idiopathic orofacial pain. Such conditions are known to be associated with underlying psychosocial distress and maladaptive health-seeking behaviors (Aggarwal et al., 2010) and will be discussed in detail later in the book. They require early recognition to avoid invasive and irreversible treatments. Diagnosis of these conditions presents a huge challenge for most dental practitioners and will be even more challenging in patients from different cultural backgrounds. Similarly, procedures like the use of hypnosis and sedation that are highly sensitive to patient behaviors also need a deeper understanding of cultural differences if they are to be implemented successfully in migrant populations.

Other chronic dental diseases have their etiologies embedded in cultural habits; the classical example being oral cancer which has an increased risk in Asian populations particularly from the Indian subcontinent due to the high rate of paan consumption (a mixture of tobacco, slaked lime, and betel nut). Dental practitioners need to be aware of the increased risk and to be vigilant when screening the oral soft tissues in these populations (Vora, Yeoman, & Hayter, 2000). Incorporation of culturally dependent risk factors in history taking will allow appropriate preventive advice. The challenge is in getting patients to reverse harmful habits, and language can be a key barrier in communicating the risk of continuing with such harmful behaviors. Practitioners also need to be aware of increased prevalence, in some cultures, of

systemic diseases that can affect dental management of patients, for example, type-2 diabetes that is prevalent in southeast Asians (Bhopal, 2012) and is discussed later in the book. Perhaps dental institutions need to do more to ensure that the pool of patients that their students treat during undergraduate training are culturally diverse so that they can gain appropriate experience in managing such patients, in particular gaining experience at reversing harmful lifestyle habits that lead to life-threatening diseases like oral cancer.

A third of the population of the United States belongs to cultural and ethnic diverse groups. They modify their diet by incorporating American food and portion size, adding this to their native eating and into their cultural habits, and diet. Their disease pattern shows increased diabetes, stroke, and cardiovascular disease. This configuration is similar to major morbidity patterns in ethnic groups in the UK. Diabetes on its own increases a patient's chance of developing cardiovascular disease, kidney failure, blindness, and limb amputation. Dental healthcare workers are in a prime position to give health information to patients who may not seek medical care. Dentists, when trained, are excellent at providing and giving culturally appropriate health messages with good results.

Therefore, in following the current biomedical approach and ignoring cultural issues, we are in danger of creating a workforce that may widen oral health inequalities if it ignores the needs of such populations which, as discussed earlier, are different both from a biological and psychosocial perspective (Garcia, Cadoret, & Henshaw, 2008). Such a workforce may lack the appropriate skills to tailor their clinical management according to the behavioral differences of the culturally heterogeneous populations around them. Indeed, the paradigm of "what can we get" rather than "how can we serve" seems to have taken a hold of the health profession. There is emerging evidence that health workers including dentists' clinical decision making is increasingly influenced by contractual and financial incentives rather than being

evidence based and that these "changes to financial incentive structures can produce large and abrupt changes in professional behaviors" (Tickle et al., 2011). This highlights the need for embedding the principles of professionalism and social responsibility into our dental undergraduates and postgraduates.

The Need for a Culturally Diverse Teaching Staff and Dental Training Courses

Perhaps the onus lies with our dental academic workforce. A recent study (Haider et al., 2011) showed that the majority of first year medical students had an implicit preference for white persons and those in the upper class, and these implicit preferences were significantly different from the participants' stated preferences. The development of implicit association tests that can identify unconscious biases early will enable timely intervention in recognizing these unconscious biases and help neutralize them at an early stage of students' careers. These biases may not only be related to race, gender, and social standing but also to inherent attitudes and expectations of dental graduates to want to earn money rather than give back to the community (Tickle et al., 2011). As Norman Bethune (Gordon & Allan, 2009) put it, "Medicine, as we are practicing it, is a luxury trade. We are selling bread at the price of jewels. . . . Let us take the profit, the private economic profit, out of medicine, and purify our profession of rapacious individualism. . . . Let us say to the people not "How much have you got?" but "How best can we serve you?"

However, the process needs to begin with training the staff that teaches the students. Over the last 20 years, dental schools have seen increased enrollment of students from ethnic minority backgrounds, resulting in almost half of the student body in any given year from these minority groups. There has also been an increase in the number of female students. These changes in the diversity of dental stu-

dents are encouraging and are an important step in achieving a culturally diverse dental workforce. Indeed, there has been recognition of the fact that an increase in student numbers from ethnic minority backgrounds requires institutions to make their environments more welcoming to these diverse student populations (Institute of Medicine, 2004; Veal et al., 2004). However, there is still much to do with regard to achieving this. A qualitative study (Veal et al., 2004) of underrepresented minority dental students showed that “many minority students were disappointed by the lack of diversity among dental school faculty.” Students also felt isolated and experienced subtle forms of discrimination (Haider et al., 2011). An Institute of Medicine Report (Institute of Medicine, 2004) recommends that “enhancing racial and ethnic diversity of health professionals education faculty can provide support for underrepresented minority students in the form of role models and mentors.”

Although this should be addressed by changing the faculty profile of existing teaching staff within dental institutions, the use of unconscious bias training is now readily available and may be extended to existing staff to increase their awareness of cultural diversity. Other measures may include blinded recruitment procedures for new graduates where references to names, race, religion, and gender are removed from the applicant’s details before the short-listing of candidates. This will minimize preconceptions arising from these areas. Interview panels for recruiting new graduates should also include staff from diverse backgrounds so that there is fair representation for the underrepresented ethnic minority applicants. Where possible, examinations and assessments should be anonymized. The difficulty arises during clinical assessments and vivas (oral tests) where biases can still influence the grades of students.

Therefore, not only is there a need for culturally aware, diverse, and linguistically competent students, but also culturally competent staff who can deliver teaching courses that

imbibe the values of cultural diversity and social responsibility within all aspects of training. A study investigating dental students’ perception of time devoted to cultural competency showed that while the majority of respondents thought that the time devoted to cultural competency education was adequate, the underrepresented minorities rated the time spent on the same as inadequate (Hewlett et al., 2007). The same study showed that culture-related content would be better incorporated into existing courses rather than as a stand-alone component (Hewlett et al., 2007).

One way to achieve this would be to integrate a bio-psychosocial approach into the teaching and training of clinical dentistry. Recently, more patient-focused approaches have tended to be replaced by quantitative rather than competency outcome measures. The majority of teaching in dentistry currently tends to follow a model whereby the number of procedures performed takes priority. Students are assessed on the quality and quantity of, for example, restorative procedures, and this often leads them into thinking of their patient as a “filling patient” or a “denture patient.” This teaching itself is following a biomedical approach, which is usually very prescriptive to clinical disease indicators. It fails to adopt an all-inclusive approach discussed earlier. Dental students graduating from such teaching systems tend to carry these models forward into their everyday working lives; that is, their responsibility stops short of restoring the dentition in a patient. In doing so, they also fail to recognize the differing needs of their local populations and of the patient as a whole. It is our responsibility to change the attitudes of the students during their medical/dental courses. In other words, we need to “modify” their conscious and unconscious biases through cultural competency training. As discussed earlier, increasing the pool of patients that students treat from culturally diverse backgrounds may achieve this, although outreach teaching centers based among culturally diverse communities may be preferable. Students then get to travel to these

communities and understand their needs better and have the added benefit of applying cultural awareness training into their clinical work.

The Need for a Culturally Balanced Academic Environment

We have already discussed many of the issues surrounding isolation of underrepresented minority dental students and some potential solutions to these. We have also highlighted the benefits to the community of a culturally diverse dental workforce. However, it is not only the community that will benefit from culturally competent graduates but the graduates themselves. One would hope that graduates who have been through cultural diversity and social responsibility training may see the concept of service as that of healthcare delivery as one of being “a serving is a relationship between equals.” The current attitude of dentists and doctors toward patients can often be simplified into “we know what’s best for you.” This gives students the experience of mastery and expertise over the patient. This is based on a kind of inequality—it is not a relationship between equals which is experienced by patients as inequality. When trying to resolve their problems, dentists inadvertently take away from patients more than they give them. Depending on the nature of the clinical problem, dentists may diminish their patients’ self-esteem, their sense of worth, and their integrity. Litigation in the dental profession has soared in recent years and often starts with a breakdown in communication between the patient and the dentist. If service is seen as a relationship between equals, then in adopting this approach, the patient is not only allowed to take ownership of their problem but may realize that the dentist has their best interests at hand. This can help avoid potential communication problems and future litigation.

Other advantages for culturally competent graduates may be opportunities gained by involvement in oral health exchange programs

both within migrant and socially deprived communities locally, as well as overseas student exchanges and voluntary work. Exchanges offer immense personal satisfaction, as well as valuable clinical experience of learning to manage populations with different needs. This experience becomes invaluable when healthcare professionals, including dentists, are involved in the management of natural disasters and other emergencies with internally displaced populations. Experience gained from working overseas and in a different cultural involvement may then directly impact on care for local populations. Offering overseas programs as part of dental undergraduate training is an invaluable part of cultural competency training. It offers an opportunity to apply the knowledge gained from cultural awareness training programs.

Future Challenges

One of the key challenges faced will be to increase the pool of culturally diverse dental academic staff. We will need to be innovative and break existing barriers, particularly those between primary dental care and academia. Currently, much of clinical teaching within dental schools is delivered by part-time general dental practitioners who are busy with their principal practice and who can only afford the time to teach for one or two sessions per week. Their commitment to the student is therefore realized only during the time that they spend in the clinics at dental schools. However, it is these very practitioners who are engaged with local communities, and many of them are from culturally diverse backgrounds and are linguistically competent in relation to the communities they serve. Their generalist background also means that they are involved in every aspect of the patient’s dental care. They offer a golden opportunity to increase the critical mass of culturally diverse staff within dental schools. We have recently proposed a career pathway for academic general dental practitioners (Aggarwal et al., 2011) that will allow dental institu-

tions to embed these generalists into their pool of clinical academic staff. These generalists might also have the added advantage of supporting and leading outreach student teaching centers in their local communities so that teaching and clinical cases provide a true reflection of the cultural diversity of the population in which the vast majority of students will spend their working lives post qualification.

Future research also needs to take into account the views of patients from underrepresented minority groups. Currently, we have good data showing the needs of underrepresented minority dental students. However, the ultimate goal of creating culturally competent graduates is to improve patient care. Therefore, the views of patients from underrepresented minority groups need to be integrated into cultural awareness courses so that they can be tailored toward the needs of the patient. Views of staff, students, and patients from well-designed qualitative studies are needed to inform and improve training in cultural diversity.

Conclusion

Given the increasing heterogeneity of populations through global migration, there has been no better time to challenge staff and students' values and beliefs, and allow them to celebrate diversity. We need to develop a dental workforce that is culturally and linguistically competent and that understands the cultural and psychosocial needs of multicultural populations to reduce oral health inequalities. We have shown how culture can affect management of dental diseases right from etiological risk factors (related to harmful lifestyle habits) through to behavioral differences displayed by patients from different cultures. As readers progress through this volume, it would seem sensible for them to explore, in relation to our discussions earlier, how the added dimension of culture might affect management of specific disease entities discussed in each chapter.

It is important that training in cultural competency does not become a mere tick-box exercise but that it is incorporated into existing courses and patient care and that it changes behavior of staff and students. Indeed, both staff and students have much to benefit by training in this area. As pointed out, student populations are becoming increasingly diverse, and it is these students that are the lifeblood of dental institutions. They need to be nurtured, respected, and made to feel welcome.

We need to develop teaching models to be embedded in training of individuals within healthcare systems. Furthermore, we need innovative tools to monitor and assess continuously how these are integrated within our current systems. Everyone—students, patients, and staff—has the right to expect and provide any communication, training, and clinical treatment with understanding, respect, and dignity.

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Oral Health and Quality of Life

2

Marita R. Inglehart

Key points

- Oral health-related quality of life (OHRQoL) refers to how patients' oral health affects their ability to function (e.g., chew and speak), their psychological and social well-being, and whether they experience pain/discomfort.
- Several valid and reliable OHRQoL scales are available to assess children's and adults' OHRQoL.
- OHRQoL can guide clinicians to gain a better understanding of their patients' oral health-related experiences and thus can increase the degree to which clinicians engage in patient-centered care.
- OHRQoL scales offer researchers an opportunity to assess subjects' OHRQoL as a valuable outcome measure in basic science, clinical, and behavioral research.
- OHRQoL is a useful concept for dental educators because it focuses students on gaining a better understanding of their patients' oral health-related experiences and care.
- A review of OHRQoL research shows that this concept can be useful in communicating oral health-related concerns to persons outside of the profession; it shows the power of adaptation and acceptance of patients who lack access to care, and it points to the need for a differentiated approach when assessing OHRQoL.

When the first edition of *Behavioral Dentistry* was published by Mostofsky, Forgione, and Giddon in 2006, research on oral health-related quality of life (OHRQoL) had just begun to develop. The chapter entitled “Quality of Life and Oral Health” (Inglehart, 2006) was therefore mostly an introduction to this topic, a reflection on the historical journey that led to research in this content area plus a discussion of the role of OHRQoL in oral health-related research, clinical practice, and dental education. Seven years later, extensive research activity related to OHRQoL has taken place, and the field is at a critical point: a Medline search with the term “quality of life” in November 2012 resulted in 104,667 hits overall; a search for “quality of life” together with “periodontal disease” led to 286 citations; a search for “quality of life” and “dental caries” yielded 184 references, and 192 citations were found when this term was combined with “orthodontics.” Considering this situation, this chapter has to go beyond offering an introduction to OHRQoL considerations and a discussion of their relevance for dental researchers, clinicians, and educators. It has to provide an analysis of the research conducted so far and provide a description of the current status quo of this research field. Based on the review of the oral health-related research conducted during the past decade, three conclusions will be discussed. First, the argument is made that OHRQoL can be a powerful communication tool when advocating for any kind of oral health-related services for patients, may it be related to educating patients about oral health promotion, or teachers or other professionals about considering oral health-related issues in their educational efforts, or even politicians involved in making healthcare-related decisions. Second, when considering the challenges concerning access to oral care that many patients still face on a daily basis in the United States, it is interesting to understand that OHRQoL research shows the amazing ability of humans to adapt to adverse circumstances, for example, to live with oral health-related functional impairments and/or

pain/discomfort on a daily basis. This finding raises the question of what can and should be done in response. Finally, the review of the literature clearly shows that there is a need to consider OHRQoL not merely as a general construct, but to also realize the value of differentiated assessments and their impact on the way that researchers’, clinicians’, and dental educators’ professional behavior and thinking might be affected by such a differentiated approach.

Oral Health-Related Quality of Life: An Introduction

Oral health-related quality of life (OHRQoL) can be defined as assessments of how oral health affects quality of life related to (a) oral functioning (such as being able to chew, bite, swallow, or speak), (b) psychological well-being (such as a person’s satisfaction with the appearance of their teeth and smile, and self-esteem), (c) social well-being (such as the level of comfort when eating or speaking in front of others), as well as (d) pain/discomfort (Inglehart & Bagramian, 2002a) (Fig. 2.1).

Before the term OHRQoL was introduced in the 1990s, patients’ oral health and outcomes of dental treatments were likely to be measured with objective indicators, such as patients’ func-

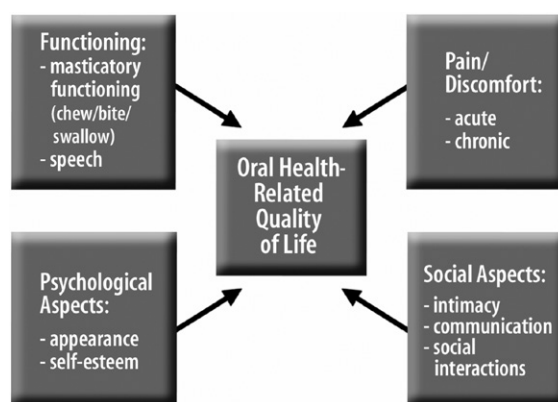


Fig. 2.1. Oral health-related quality of life: an overview.

tional status (e.g., number of missing teeth), and the degree to which caries (e.g., number of decayed, missing, or filled teeth or surfaces due to caries) or periodontal disease (e.g., indicators of probing depths or attachment loss) were present. The introduction of OHRQoL opened up a new perspective by suggesting considerations of how oral health/disease and the treatment of oral disease affect patients' lives in general. It moved the perspective from being bio-dentally oriented to taking a "bio-psycho-social-dental" approach, in short, a patient-centered approach.

This paradigm shift from defining health and disease in a purely biological manner may have begun when the World Health Organization offered its programmatic definition of health as more than just physical health in the 1940s (World Health Organization, 1948). However, this perspective did not really systematically develop until the 1970s when scientists and patients alike began to consider it explicitly. In medicine, Engel (1977) introduced his now-famous biopsychosocial model of health in this time period. This model stressed a holistic approach to patient care and reflected on the value of treating patients instead of "body parts." Around this same time, a change occurred in the way the term "quality of life" was used in the social sciences. Until the 1970s, quality of life had been largely used to describe societies. Starting in the 1970s, the term began to be used when analyzing individuals' well-being (Campbell, 1976; Andrews & McKennell, 1980). In psychology, wellness began to be considered as a crucial aspect of a person's life, and health psychology and positive psychology began to develop as independent areas of research around this time (Peterson, 2002).

While it took the health-oriented research community until the 1970s to start focusing on the concept of quality of life, one could argue that patients' interactions with the healthcare system have always been affected by quality of life issues, such as suffering from pain or not being able to function. Thinking back in the history of dentistry, patients have been moti-

vated to seek (or avoid) dental care because of quality of life issues since the beginning of dentistry. Having a toothache, being afraid of pain, or wanting dentures to enhance appearance and/or functioning are all related to patients' quality of life and their motivation to visit or avoid dentists. First references to the relationship between oral health and quality of life can be found as early as 1978 when Giddon (1978) discussed the relationship between the mouth and patients' quality of life (see also Giddon, 1987). However, OHRQoL was not empirically explored until the early 1990s when the National Institute of Dental and Craniofacial Research (NIDCR) introduced the concept of OHRQoL to the scientific community by funding two major conferences with a focus on this term and supporting significant numbers of research studies on this topic (Bryant & Kleinman, 2002). The first conference was organized by Slade in 1996 and focused on the measurement of OHRQoL (Slade, 1997a). Slade brought together the leading researchers on OHRQoL, such as Atchison (Atchison & Dolan, 1990), Cohen (Cohen & Jago, 1976), Gift (Gift & Redford, 1992; Gift & Atchison, 1995), Kressin (1996), Locker (1988), Reisine (1988), Sheiham, Maizels, and Maizels (1987), and Strauss (Strauss & Hunt, 1993) for a conference in Chapel Hill, NC, and collected their contributions in a book that documented the state of the art of measuring OHRQoL at that time. In May 2000, Bagramian and Inglehart organized the second NIDCR-funded conference as an interdisciplinary workshop on OHRQoL at the University of Michigan (see Inglehart & Bagramian, 2002b). This meeting had over 80 participants from as far away as Great Britain and South America who worked together with researchers from dentistry, medicine, nursing, psychology, and public health to reflect on the role of OHRQoL for clinicians, as well as basic, clinical, and behavioral researchers and dental educators in the oral health sciences. These two meetings have inspired numerous research studies since then and made the term OHRQoL widely used—as literature searches mentioned previously showed.

Having a chapter on OHRQoL in this volume on *Behavioral Dentistry* can show how a behavioral science concept can enrich and refocus research in the oral health sciences, how it can contribute to making clinicians more patient centered, and how it can guide dental/dental hygiene educators in their efforts to educate patient-centered and culturally sensitive future providers who see the value of working in interdisciplinary teams, including behavioral scientists.

Oral Health-Related Quality of Life: How Do We Assess It?

One major step in establishing a new concept in a scientific field is to develop reliable and valid measurement instruments. Slade (2002) provided an excellent overview of the three ways OHRQoL is assessed, namely, with social indicators, global self-ratings of OHRQoL, and multiple-item surveys of OHRQoL. Social indicators of OHRQoL, such as the days of restricted work due to dental visits, or days of work missed because of dental pain (see Reisine, 1985, for a first pioneering study; Gift, 1992), or children's restricted activity days due to dental problems or dental visits (General Accounting Office, 2000), can serve an important function by showing that oral disease has a clear impact on society as a whole. Global self-ratings of OHRQoL usually ask respondents in surveys such as the third National Health and Nutrition Examination Survey (NHANES) of the U.S. adult population to rate their dental health on a 5-point scale ranging from 1 = "poor" to 5 = "excellent" (see Gift, Atchison, & Drury, 1998). Such a global assessment can allow comparisons between different population groups in one country, or even between countries (see, e.g., the results of the International Collaborative Study; Chen et al., 1997). However, it clearly does not reflect the complexity of OHRQoL concerns. Multiple-item surveys are the instruments of choice when patients or research subjects' OHRQoL should be assessed. Slade

(2002) offered an excellent overview of 10 OHRQoL questionnaires for adults. He showed that these surveys do not only differ in the number of dimensions of quality of life they consider, but that they also range in the number of items from merely 3 items to as much as 56 questions.

One of the most widely used instruments is the Oral Health Impact Profile (OHIP; Slade & Spencer, 1994). It consists of 49 questions concerned with the respondents' functioning, pain, physical, psychological, and social disability, and handicap. The items are answered on 5-point rating scales. A short version of this scale, the OHIP-14, is available as well (Slade, 1997b). This short version is the most widely used instrument to assess OHRQoL. It is not only used with English-speaking respondents, but has also been translated into several other languages such as Arabic (Al-Jundi, Szentpétery, & John, 2007), Dutch (van der Meulen et al., 2008), German (John, Patrick, & Slade, 2002), Hebrew (Kushnir, Zusman, & Robinson, 2004), Sinhalese (Ekanayake & Perera, 2003), Spanish (Lopez & Baelum, 2006; Montero-Martín et al., 2009), and even Vietnamese (Gerritsen et al., 2012).

In addition to these general OHRQoL scales, condition-specific scales, such as the Xerostomia-Related Quality of Life Scale (Henson et al., 2001) or the Dentin Hypersensitivity-Related Quality of Life Scale (DHS-QoL) (Inglehart, Bagramian, & Temple, 2013a), were developed as well. An example of how such condition-specific scales are designed is provided by Inglehart et al. (2013a) who developed the DHS-QoL which consists of 24 Likert-type items with 5-point answer scales (ranging from 1 = "disagree strongly" to 5 = "agree strongly"). The selection of these 24 items was based on a focus group study with 86 adult patients with DHS in 13 focus groups. The information gathered in these focus groups was used to develop a pilot survey with 61 statements concerning how DHS affected patients' QoL. This pilot survey was administered to 294 patients (DHS: 70%) and 219 dental students (DHS: 23%). Based on the analyses of these data, 40 statements

were identified for which (a) the answers of respondents with DHS versus without DHS differed significantly, and (b) high correlations between the responses and the oral exam data were found. These statements were then used in a second survey with 316 patients (DHS: 73%) and 317 dental students (DHS: 20%) in a subsequent validation study. Based on these findings, 24 items were selected for the final DHS-QoL Scale. In addition to a total DHS-QoL score, three subscores can be computed: subscale 1 assesses pain/discomfort related to DHS ($n = 8$ items; Cronbach's $\alpha = 0.95$); subscale 2 assesses general consequences of DHS on patients' lives ($n = 8$ items; Cronbach $\alpha = 0.93$), and subscale 3 measures how DHS affects patients' behavior ($n = 8$ items; Cronbach's $\alpha = 0.92$). Factor analytically determined construct validity, as well as external validity (assessed with correlations between the DHS scores and the number of teeth with DHS as determined in oral exams) of the total and subscales were excellent.

In addition to scales that assess the OHRQoL of adults, several scales have been developed to assess children's OHRQoL. Some of these scales measure children's OHRQoL directly by asking the children, while other scales are proxy measurements that require parents to assess their children's OHRQoL. One scale that can be used with children as young as 5 years of age is the Michigan Oral Health-Related Quality of Life Scale—Child Version (MOHRQoL-C) (Filstrup et al., 2003; Inglehart et al., 2006). Inglehart et al. (2006) used this scale with children as young as 5 years of age. However, before administering this scale to very young children, they use two prescreening questions ("How old are you?" and "What does a dentist do?") and then only continue to ask the MOHRQoL-C questions if the children answer both prescreening questions correctly. The scale consists of direct questions and has a "Yes"/"No" answer format (see Table 2.1 for the wording of the questions and the scoring).

In addition to this MOHRQoL-C, the authors also developed an MOHRQoL-Parent/Proxy

Version of this scale (see Table 2.2). This proxy version can be used when children are too young to answer the questions themselves or if they have special healthcare needs that do not allow them to respond to the items directly. However, such a scale has also value in itself because it allows assessing if parents are actually aware that their child has an impaired OHRQoL (see Filstrup et al., 2003). In addition, it can be quite interesting to explore whether children and parents agree on the degree to which a child's OHRQoL and related behavior is affected by an oral health-related issue such as caries (Patel, Tootla, & Inglehart, 2007) or a cleft lip and/or palate (Munz, Edwards, & Inglehart, 2011). An additional benefit of asking parents or caregivers about another person's OHRQoL may be that it might engage this person in reflecting on the importance of oral health for this person's quality of life.

Several scales were developed to assess OHRQoL in older children. For example, Jokovic and colleagues developed the Child Perception Questionnaire (CPQ)₈₋₁₀ (the subscripts 8-10 indicate the age range for which the questionnaire can be used) for assessing OHRQoL in 8- to 10-year-old children (Jokovic et al., 2004b) and the CPQ₁₁₋₁₄ for 11- to 14-year-old children (Jokovic et al., 2002), as well as a parent proxy scale (PPQ; Jokovic et al., 2003; Jokovic, Locker, & Guyatt, 2004a). Do and Spencer (2008) showed in an evaluation study of these surveys with 1401 children between 8 and 13 years and parents that these scales had acceptable internal consistency and construct validity.

Broder and her colleagues (Broder, McGrath, & Cisneros, 2007; Broder & Wilson-Genderson, 2007; Wilson-Genderson, Broder, & Phillips, 2007) developed the Child Oral Health Impact Profile (COHIP) for children as young as 8 years of age and their caregivers. These authors found low to modest correlations between children and their parents' proxy assessments of their children's OHRQoL scores. Based on these findings, they argue that children's OHRQoL should be assessed both by asking the child directly as well as collecting proxy assessments.

Table 2.1 Michigan Oral Health-related Quality of Life Scale—Child Version (MOHRQoL-C) (Inglehart et al., 2006)

Screening questions for young children:

"How old are you?" and "What does a dentist do?"
Continue with MOHRQoL-C questions, if children answer both questions correctly.

MOHRQoL-C

Now we ask you some questions about your teeth:

a. Do your teeth hurt you now?	Yes	☐	No	☐
b. Do your teeth hurt when you eat something hot or cold?	Yes	☐	No	☐
c. Do your teeth hurt when you eat something sweet?	Yes	☐	No	☐
d. Do your teeth hurt when you chew or bite?	Yes	☐	No	☐
e. Does it hurt when you open your mouth wide?	Yes	☐	No	☐
f. Do you hear a noise (clicking) here (point to TMJ area) when you open your mouth wide and close it?	Yes	☐	No	☐
g. Do the sides of your face hurt when you chew on tough food?	Yes	☐	No	☐
h. Does a hurting tooth ever wake you up at night?	Yes	☐	No	☐
i. Does a hurting tooth ever stop you from playing?	Yes	☐	No	☐
j. Does a tooth ever hurt you while you are in school?	Yes	☐	No	☐
k. Does a hurting tooth ever keep you home from school?	Yes	☐	No	☐
l. Does a hurting tooth keep you from learning in school?	Yes	☐	No	☐
m. Does a hurting tooth ever keep you from paying attention in school?	Yes	☐	No	☐
n. Do you like your teeth?	Yes	☐	No	☐
o. Do you have a nice smile?	Yes	☐	No	☐
p. Do kids make fun of your teeth?	Yes	☐	No	☐
q. Do you want braces for your teeth?	Yes	☐	No	☐
r. Are you happy with your teeth?	Yes	☐	No	☐

If no, please, tell me why you are not happy?
Is there anything else you want to tell us about your teeth?
Thank you very much for answering these questions.

Scoring

Total OHRQoL score: add 1 point for each "yes" answer.
Subscores: Questions a, b, c, and d assess pain/discomfort.
 Questions e, f, and g assess temporomandibular joint (TMJ) problems.
 Questions h, i, j, k, l, and m assess the consequences of poor oral health.
 Questions n, o, p, q, and r assess the psychological/esthetic component of OHRQoL.
 We use the open-ended questions when working with individual children to assess their chief complaints.

Table 2.2 Michigan Oral Health-Related Quality of Life Scale—Parent Version (MOHRQoL-P)

Please, tell me for each of the following sentences how much you agree with it. Please give your answers on the 5-point answer scale ranging from 1 = “disagree strongly” and 5 = “agree strongly.”

	Disagree strongly				Agree strongly
(a) My child has a toothache or pain currently.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
(b) My child’s teeth hurt when he/she eats/drinks something hot or cold.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
(c) My child’s teeth hurt when he/she eats/drinks something sweet.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
(d) My child’s teeth hurt when he/she bites/chews.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
(e) My child has pain when he/she opens his/her mouth wide.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
(f) My child sometimes wakes up at night with a toothache.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
(g) My child sometimes has a toothache at school.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
(h) My child sometimes misses a day of school because of a toothache.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
(i) My child has a nice smile.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
(j) My child is happy with his/her teeth.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
(k) My child sometimes complains about his/her teeth.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

In summary, a review of the literature concerning measurement instruments for assessing OHRQoL in adults and in children shows that reliable and valid general scales, as well as some oral disease-specific scales, are available. This situation has allowed the inclusion of OHRQoL in a wide range of oral health-related research studies.

Oral Health-Related Quality of Life: Its Role in Research

Given the recent paradigm shift from a purely bio-dental approach to a “bio-psychosocial-dental” approach in the oral health sciences, it is not surprising that OHRQoL has begun to play an increasingly more important role in oral health-related research. Research concerning oral health issues is amazingly diverse. It ranges from basic science research, to clinical, behavioral, and public health-related studies, and it addresses quite diverse topics ranging from

tissue regeneration to access to care issues. OHRQoL can play an important role in all of these different types of research.

Concerning basic science research, Somerman (2002) presented a powerful argument when she pointed out that the outcome of all research endeavors is the improvement of orocraniofacial health and ultimately quality of life, and that basic science research cannot reach this outcome in isolation. She described how basic science research has to become part of an interwoven cycle of activity, where it connects with translational, clinical, behavioral, and health services research, as well as with clinical practice and education to ultimately reach the goal of improving oral health. She illustrated this vision of the interconnectedness of basic science research by using one specific area of research in the oral health sciences, namely, the regeneration of orocraniofacial tissues as an example. Her analysis of this research field led her to argue that while considerable progress has been made in the areas of biomimetics, biomaterials,

and tissue engineering, the existing therapies based on this research have limitations. In order to develop therapies that have more predictable outcomes and truly enhance patients' oral health and quality of life, many factors such as the pain involved for the patient, and esthetic concerns need to be addressed. In summary, her argument focused on breaking basic science research out of its relative isolation, by demonstrating that the ultimate goal of enhancing oral health and quality of life can only be reached in an interconnected effort with other researchers, clinicians, and educators. OHRQoL in her argument is not merely the ultimate outcome of basic research, but guides it by providing additional factors that need to be considered on the way to new therapies (Somerman, 2002).

Clinical research quite obviously needs to consider OHRQoL as one important short- and long-term outcome of oral health-related interventions. Analyzing OHRQoL outcomes can make an important contribution when deciding for or against adopting a new treatment approach. Henson et al. (2001) showed, for example, how preserving salivary output in head and neck cancer patients by using parotid-sparing radiotherapy affected these patients' quality of life quite significantly. Patients who had been treated with the traditional radiotherapy had significantly worse quality of life scores than patients treated with the new approach.

However, even clinical research concerning the outcomes of relatively common treatments, such as providing patients with removable dentures, can benefit from including OHRQoL as outcome measures. Not only can such an inclusion allow the assessment of the benefits of different treatment approaches (such as by comparing OHRQoL outcomes of patients who receive implant-retained dentures vs. traditional dentures), but the documentation of the change in OHRQoL from before to after the treatment can be of significant value when advocating for healthcare coverage for certain types of treatment. In addition, it can be quite informative for providers to analyze these patients' expectations concerning their OHRQoL

before they receive their dentures and then compare these expectations with the actual OHRQoL after the treatment is completed (Hamerink, Piskowski, & Inglehart, 2013). Understanding these dynamics can support providers' efforts to communicate successfully with their patients over the course of the treatment.

In other instances, quality of life concerns can provide an argument against using a new treatment approach—despite its clinical effectiveness. Inglehart et al. (2007) showed, for example, that chemomechanical caries removal in children may not be preferable compared to the traditional technique. These authors used a randomized controlled clinical trial to compare the clinical efficacy, operator perspective, and patient perspective of chemomechanical and traditional caries removal of 22 first and second occlusally cavitated deciduous molars, respectively. They found that the new technique took significantly more time than the older method. This fact may explain why the operators reported significantly worse ratings of the children's behavior in the chemomechanical condition than in the traditional condition, and why the children did not respond positively to the new treatment. If effectiveness alone would have been the criteria to evaluate this new technique, it would have resulted in a quite favorable evaluation. However, the consideration of how the new technique affected the pediatric patients' quality of life can be a powerful consideration for clinicians who consider the adoption of such a new technique.

Clinical research also needs to carefully assess long-term outcomes of certain treatments. One example for OHRQoL research with this objective in mind was research concerned with the quality of life of denture patients. Gray, Inglehart, and Sarment (2002) showed, for example, that quite a considerable percentage of the 120 research respondents with conventional dentures who had received their dentures between 5 months and 9 years before they participated in the study reported either discomfort (20%) or strong discomfort (20%) caused by

their dentures. Understanding what may affect whether denture patients have a positive or poor OHRQoL is therefore a crucial question (see also Heydecke et al., 2004).

Finally, behavioral and public health researchers studying oral health issues can also benefit from considering OHRQoL indicators (Eklund & Burt, 2002). Understanding how oral health disparities and lack of access to care affect the quality of life of millions of U.S. citizens (US Department of Health and Human Services, 2000) not only needs to be carefully documented to inform politicians and the public in general about the status quo, but it can also be potentially a powerful tool for advocates who want to reduce these disparities and bring more social justice to the healthcare system. In some instances, it can even demonstrate potential overtreatment of patients, such as when analyzing the objective orthodontic treatment need of school-age children, their own OHRQoL assessments, and dentists' potential treatment recommendations (Christopherson, Briskie, & Inglehart, 2009a,b).

While these examples might raise a certain level of awareness, additional information about these issues can be found in the review article by Sischo and Broder (2011) who did an excellent job developing the argument for considering OHRQoL when conducting survey research in the oral health sciences.

In summary, including OHRQoL data in basic science, clinical, behavioral, and health services research can help researchers focus on patient-related outcomes and can provide a common denominator that connects researchers from different research backgrounds and with various research agendas.

Oral Health-Related Quality of Life and Clinical Practice

OHRQoL cannot merely offer a new perspective for researchers in the oral health sciences, it can also affirm a clinician's patient-centered approach to providing care, and thus ultimately

improve patient-provider interactions. When Atchison (2002) reflected on the role of OHRQoL in the clinical domain, she called her chapter "Understanding the 'Quality' in Quality Care and Quality of Life." This title could serve as a reminder for clinicians to reflect on the meaning of the term "quality care" and the role OHRQoL issues should play when providing quality care for all patients. From the moment patients schedule a dental appointment, to the time when they leave the dental office and return to their regimen of oral health promotion at home, OHRQoL can be of considerable importance. Providing quality care has to begin with taking a medical and dental history that includes questions concerning how oral health affects the patient's quality of life. Understanding the relevance of a patient's chief complaint for this patient's quality of life can be crucial in getting a clear sense of the patient's expectations concerning the treatment outcome. Assuring that treatment is provided in a way that pain is avoided to the degree possible, and providing pain medication in such a way that pain is managed well, are just two instances that stress that a clinician considers the patient's quality of life issues. Ultimately, such a consideration will not merely benefit the patient, but will be positive for all persons involved in the clinical interaction. A recent study with adolescent orthodontic patients showed, for example, that the best predictor of the number of missed appointments (as determined in a clinical chart review) was the pain these patients reported to have experienced during their orthodontic appointments (Khan et al., 2004). The more pain the patients reported to have suffered, the more missed appointments they had. Unfortunately, research showed that many orthodontists were not aware of how orthodontic treatment affected their patients' quality of life and were not focused on educating their patients, for example, about pain management to improve their quality of life (Krukemeyer, Arruda, & Inglehart, 2009). These findings are just two of many research results that show that patients' quality of life concerns can shape their seeking or

avoiding dental care, and can affect their cooperation with treatment recommendations. Finally, even when providing oral hygiene instructions and health education in general, a consideration of the patient's quality of life may be one crucial factor that will ultimately determine if the patient will engage in the recommended course of action or not. In summary, OHRQoL is a concept that clinicians could use as a one guiding consideration in all patient interactions. It would assure that the care they provide is patient centered.

Oral Health-Related Quality of Life and Dental/Dental Hygiene Education

In 1995, the Institute of Medicine published a report on the future of dental education with some clear recommendations (Institute of Medicine. Committee on the Future of Dental Education, 1995). Some of these central recommendations were concerned with educating future healthcare providers in such a way that they will provide truly patient-centered care, will be culturally literate and sensitive to diversity issues, and be able to work with an interdisciplinary perspective that sees oral health in the context of a patient's overall health. Inglehart, Tedesco, and Valachovic (2002) took these recommendations as a starting point to reflect which role OHRQoL issues could play in this situation. They started with an analysis of survey data from 1864 dental school faculty, directors in hospital programs, dental hygiene, and dental assistant programs who had rated the importance of these recommendations. Their results provided insight into whether dental educators are willing to act according to these recommendations. Their findings showed that the respondents rated the importance of offering patient-centered education rather highly. Given this finding, the next question was how dental/dental hygiene educators can translate this objective into their concrete classroom and clinic-based activities. Inglehart et al.

(2002) argued that OHRQoL could serve as a portal to patient-centered education by shaping the content and thus the focus of educational efforts in classrooms, clinics, and community settings. Explicitly encouraging students to reflect on how health and disease affect patients' quality of life, and which role quality of life concerns can play for their patient's utilization versus avoidance of healthcare services, may be a valuable way to educate patient-centered future providers.

Oral Health-Related Quality of Life: An Analysis of the Status Quo

After introducing the reader to the concept of OHRQoL and demonstrating that assessment tools for this concept are available, and after describing how OHRQoL can be of importance in oral health-related research, clinical practice, and the education of future dental care providers, it seems crucial to consider the status quo of this research and the open questions that need to be addressed in the future. Three considerations are of interest here. The first consideration focuses on the fact that OHRQoL can be a powerful communication tool on all levels of communication. The second consideration draws attention to the fact that humans have a tremendous capacity to accept the status quo, in this case, poor OHRQoL, and that experts need to consider this finding in their research and advocacy efforts. Finally, an analysis of research findings points to the fact that a differentiated approach to understanding OHRQoL might have to be developed for optimal use of the OHRQoL concept both in research as well as in clinical practice.

OHRQoL: A Powerful Communication Tool

OHRQoL can be a powerful communication tool in several ways. First, it can help patients to communicate their concerns to their provid-

ers. For example, a recent study with elementary schoolchildren showed that quite a significant percentage of these children had an impaired OHRQoL related to temporomandibular joint issues (Widmalm, Daneshvar, & Inglehart, 2006). For example, 17% of these nearly 4000 kindergarten through grade 5 students reported that they had pain when they opened their mouth wide, 25% indicated that they heard a noise (clicking) when they opened their mouth wide and close it, and 24% answered that the sides of their face hurt when they chew on tough food. If providers ask their patients OHRQoL questions, they will learn about these facts and can then treat their patients more appropriately.

Second, OHRQoL can be a powerful communication tool that providers can use to provide more patient-centered care. For example, if providers are aware that a substantial percentage of their orthodontic patients will have pain following their visit to the orthodontist, they can utilize this knowledge about their patients' impaired quality of life to prevent and manage this pain/discomfort better (Kruke-meyer et al., 2009).

Finally, OHRQoL can be a powerful communication tool for dental care providers to educate other "stakeholders," such as children's parents or their teachers. In one focus group study with teachers in schools in socioeconomically disadvantaged neighborhoods (Inglehart, Kritt, & Briskie, 2008), a handout was provided at the beginning of the focus groups, with information about the results from OHRQoL interviews with the teachers' students. When the teachers saw the high percentages of their students who reported to currently have a toothache, to have missed school because of a toothache, and to not having slept through the night because of a toothache, one teacher stated: "I knew my kids are sitting in my classroom and are hungry. But now I realize that they might also have pain." This teacher then continued to explain how she would make sure to educate her students about good oral hygiene and the fact that a community dental clinic provides care for patients

without dental insurance. The question is how OHRQoL can be used more widely to educate teachers about the need for good oral health education of their students. But even more crucial is the task to identify ways to use OHRQoL as a tool to advocate for good oral health and access to oral healthcare services for all U.S. citizens.

OHRQoL: The Challenge of Human Adaptation

One fact that the above-described focus group study with teachers (Inglehart et al., 2008) clearly showed was that despite the fact that around 50% of the children in these schools had untreated caries, that about 18% had abscesses and/or caries with pulpal involvement, and that high percentages of these children reported that they had toothaches at the time of the oral screenings, these kindergarten through grade 5 students rarely—if ever—complained about their pain. It seemed as if the children in these socioeconomically disadvantaged neighborhoods accepted dental pain as a fact of life. The same finding was also documented in a study with migrant farm workers in upper Michigan. Gavaldon, Bagramian, and Inglehart (2010) found that 8.4% of these migrant workers had missing teeth in the front of their mouth, that based on clinical exams 22% had abscesses and that based on radiographs 31% had abscesses, and that 69% had untreated decay; overall, they reported a quite positive OHRQoL. These findings should alert OHRQoL researchers to two considerations. First, even if patients have a poor OHRQoL, they might accept the pain they experience and the daily functional impairments and social consequences as facts of their lives. Second, they might even accept it based on social comparisons with others around them. While this human adaptation clearly serves a function for these patients, it raises the question how OHRQoL researchers and clinicians can utilize their understanding of their patients' situation and take on the challenge of improving their patients' oral health status.

OHRQoL: The Need for Differentiation

After more than a decade of OHRQoL research, a third consideration focuses on the need for differentiation of our understanding of the relationship between oral health and oral health-related treatments and how they are related to patients' OHRQoL. In a recent study by Inglehart et al. (2013b), the relationships between different aspects of patients' oral health and dental treatments and their OHRQoL were analyzed by collecting survey and clinical chart review data from 705 adult dental patients. The patients' OHRQoL was assessed with the OHIP-14 (Slade, 1997b) and the MOHRQoL (Henson et al., 2001) Scales. The results showed that the two OHRQoL measures were highly correlated and had excellent inter-item consistency. The interesting findings were that both OHRQoL measures were significantly correlated with certain oral health indicators—but not with others. They both were clearly related to caries indicators, such as the number of clinically determined decayed surfaces; they also correlated with the total number of missing teeth as well as the number of teeth in the esthetic zone. However, they did not correlate significantly with indicators of periodontal disease that patients might not be aware of, such as the number of teeth with pockets of 4mm or more and the number of teeth with furcation involvement. They only correlated with the periodontal indicators that patients are actually cognizant of, such as the number of teeth with mobility and the percentage of teeth with bleeding points. In addition, while significant relationships between the patients' OHRQoL and certain treatments such as the use of dental prostheses were found, other dental treatments such as the number of fillings were not correlated with these OHRQoL indicators. These findings point to the importance of understanding which specific oral health issues and which specific dental treatments are related to OHRQoL, and which are not. It seems as if only those oral health issues that the patient is clearly aware of will correlate with their OHRQoL. Future research should explore this

consideration in more detail. However, understanding this situation will allow clinicians to more appropriately communicate with their patients about their oral health issues and treatment. They can count on communicating with their patients about their treatment needs that directly affect their quality of life (e.g., care = caries and missing teeth). However, when communicating about periodontal disease and the need for treatment, future impairments of OHRQoL (e.g., future tooth mobility and tooth loss) might have to be communicated because current indicators of poor oral health (such as probing depths of 4mm or more) are not only not perceived by patients and related to their OHRQoL, but they might not be considered as important.

Oral Health-Related Quality of Life and Behavioral Scientists: Concluding Remarks

Fifteen years ago, a chapter on OHRQoL would not have been included in a volume on behavioral science contributions to dentistry. The concept would have been too new and unexplored to justify an inclusion. In 2013, this situation is quite different. Over the past few years, an increasing number of publications showed that OHRQoL is a powerful concept that can help researchers in the oral health sciences, clinicians, and educators alike to reflect on the ultimate objectives they have for their work (Inglehart & Bagramian, 2002b). For behavioral scientists working in dentistry, this concept can open doors by helping them to communicate the important role played by the patient and the patient's behavior in oral health and disease and in oral healthcare interactions. This chapter shows that OHRQoL can be of importance in a wide range of settings. It was written with the goal to raise interest in this concept and challenge researchers in the oral health sciences, clinicians, and dental educators to consider this psychosocial concept in their professional activities.

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3

Stress and Inflammation

Annsofi Johannsen and Anders Gustafsson

Key points

- Psychosocial stress has been associated with poor oral hygiene and smoking, and they seem to have a synergistic effect.
- Stressors have a detrimental effect on chronic immune-mediated inflammatory diseases, including periodontitis and also on the immune system.
- Stress seems to have a hyperinflammatory effect rather than a hypoinflammatory effect.
- Taken together, recent research indicates that stress can be considered a risk factor for periodontal disease.
- Clinical implications are obvious as it is important for members in the dental team to be aware of how stress can influence patient compliance and response to treatment.

Introduction

Stress has been proposed to be a “risk factor” for periodontal diseases and to play a central role in disease development and progression (Stabholz, Soskolne, & Shapira, 2010). Cross-sectional and case-controls studies have highlighted a possible relationship between different psychological stresses and periodontitis (Monteiro da Silva et al., 1996; Croucher et al., 1997; Genco et al., 1999; Hugoson, Ljungquist, & Breivik, 2002; Dolic et al., 2005). This review will examine different mechanisms, such as biochemical mediators, immune functions, neurological and endocrine alterations, as well as behavioral changes, including oral hygiene and smoking habits, which can influence periodontal status. The periodontal disease–stress relationship is complex, but it is possible to relate important pathways together to explain the link between stress and inflammation. How stress influences inflammation and at what level has not been fully determined and needs to be interpreted with caution.

Stress

Stress is a response state of the organism to forces acting simultaneously on the body which, if excessive, lead to diseases of adaptation and eventually to diseases of exhaustion and death (Selye, 1956).

Stress as a “state of threatened homeostasis, which is constantly challenged or outright threatened by intrinsic or extrinsic, real or perceived disturbing forces or stressors.” Stress may have adverse consequences on physiologic functions such as growth, metabolism, circulation, reproduction, and the inflammatory/immune response (Chrousos & Gold, 1992; Chrousos, 1995).

The term “stress” should be restricted to conditions where an environmental demand exceeds the natural regulatory capacity of an organism, in particular, situations that include unpredictability and uncontrollability (Koolhaas et al., 2011).

Stress and Periodontal Disease: Epidemiological and Clinical Findings

In the 1960s, animal studies conducted and demonstrated a possible detrimental role for stress in periodontal tissues (Shklar & Glickman, 1959; Stahl, 1961). However, more recently, Gasparsic, Stiblar-Martincic, and Skaleric (2002) reported significant differences in attachment loss and bone resorptions between stress restraint group compared to control group. Similar results were shown in a very recent study in Wistar rats (Semenoff-Segundo et al., 2012). The study showed physical stress increased attachment and bone loss after ligature-induced periodontitis. The non-periodontitis side, that is, the side without ligature, was not affected by the stress.

Several earlier studies found a relationship between psychosocial stress, for example, unemployment, work-related mental demand, marital status, and periodontal disease (Marceles & Sheiham, 1992; Croucher et al., 1997; Hugoson et al., 2002). Severe periodontitis has been associated with depression and loneliness compared to patients with chronic periodontitis (Monteiro da Silva et al., 1996). High levels of anxiety appear to be closely associated with periodontal disease (Vettore et al., 2003). Similarly, Ng and Leung (2006) showed, in a cross-sectional study comprising 1000 subjects aged 25–64 years in Hong Kong, that anxiety and depression significantly increased clinical attachment loss (CAL) (OR = 1.51; 95% CI = 1.09–2.72 and OR = 1.41; 95% CI = 1.17–2.78, respectively). Financial strain have been shown to be significantly related to increased CAL and alveolar bone loss (ABL) (OR = 1.70; 95% CI = 1.09–2.65 and OR = 1.68; 95% CI = 1.20–2.37, respectively), after adjustments for age, gender, and cigarette smoking (Genco et al., 1999). Furthermore, persons with greater financial strain and inadequate coping experienced a higher risk of more severe CAL (OR = 2.24; 95% CI = 1.15–3.17), and ABL (OR = 1.91; 95% CI = 1.15–3.17). In addition, marital status and

loss of spouse were significantly related to an increased risk of severe periodontal disease (OR = 2.69; 95% CI = 1.28–5.64) (Hugoson et al., 2002). Number of teeth with CAL > 5 mm, and stress reported a positive correlation, when adjusted for age ($r = 0.56$, 0.001) (Rai et al., 2011). However, there are studies that did not show an association between stress and periodontal disease. A study from Brazil, comprising 160 randomly selected subjects, could not show an association between psychiatric symptoms, depression symptoms or hopelessness, and a greater risk for developing periodontitis (Solis et al., 2004). In a similar study, Castro et al. (2006) failed to demonstrate that psychosocial factors increased the risk of periodontal disease.

Limitations

Conflicting evidence concerning the influence of stress on periodontal disease might be due to the diversity of self-reported questionnaires that have been used as the psychometric instrument. It should be considered that stress is not the same experience for everyone. Similar stressors could have different effects on different individuals, for example, depending on how much social support is available from family and friends (see Sheiham & Nicolau, 2005, for a review), and how a person handles or copes with stress (Folkman, 1984). Therefore, the measurement of biological markers could provide a more objective method to monitor psychosocial status. Furthermore, it is important to take into account different kinds of stress, acute or chronic, controllable or not controllable. Acute stress can be defined as a sudden and short-lasting stress event, such as academic stress, which can induce inflammatory signals at sites of ongoing inflammation (Weik et al., 2008). The selection of patients with different levels of periodontal disease may influence the outcome of stress measurements, as well as the definition of periodontitis. Although taking into consideration the above-mentioned limitations, it can be concluded that a majority of the studies

investigating stress and periodontal status show a detrimental effect.

Possible Mechanisms

Stress can influence periodontal health status in several ways. It can have a primary effect on the inflammatory response and the immune system. It can also change health behavior, including oral hygiene habits and smoking habits, and thus influence periodontal health as a secondary effect. It is probable that the detrimental effects of stress on periodontal health that have been reported in many studies are due to a combination of both pathways.

Effects on the Immune System and Inflammatory Response

The continuous interactions between physiological, immunological, and psychological responses to acute stress are important defense mechanisms and protect the individual from excessive inflammation. However, if the trauma becomes too extreme or chronic, biological changes leading to increased systemic inflammation seem to occur. The research around the mechanism for this remains still inconsistent, but some studies suggest a peripheral decrease in sensitivity for glucocorticoids (see Rohleder, 2012, for a review). An increased inflammatory response correspond to the overall hypothesis that periodontitis is a hyper-inflammatory condition rather than a hypoinflammatory condition.

Breivik et al. (2000) demonstrated in a series of experiments a brain-neuroendocrine-immune regulatory mechanism. The group showed that genetically determined hypothalamus-pituitary-adrenal (HPA) reactivity seemed to play an important role in attachment and bone loss in a ligature-induced periodontitis model in rats. More recently, Peruzzo et al. (2008) also reported an animal model, whereby chronic stress induced the elevation of glucocorticoid and catecholamine levels after 30 days.

Simultaneously, chronic stress significantly increased bone loss resulting from ligature-induced periodontitis. The bone loss corresponded with an increase in RNA levels of interleukin (IL)-1 β (IL-1 β), IL-6, IL-10, interferon-gamma (IFN- γ), and receptor activator of nuclear factor-kappa B ligand (RANKL). In addition, a relationship between enhanced prostaglandin E₂ (PGE₂) and bone loss under stress *in vitro* was also found (Castagliuolo et al., 1996).

Corresponding results have been found in gingival crevicular fluid (GCF) from humans. Giannopoulou, Kamma, and Mombelli (2003) found a significant correlation between stress and the proinflammatory cytokines, IL-1 β , IL-6, and IL-8, which could reflect ongoing periodontal destruction. In a comparable study among patients with aggressive periodontitis, a significant relationship between stress and IL-1 β , IL-6, and IL-8 was found (Kamma et al., 2004). This study also demonstrated a significant interaction between stress, smoking, and increased levels of IL-8 in these patients. The authors suggest that smokers and the stressed patients may have had more disease symptoms because of both smoking and stress-influenced host-related factors, including the cytokine network.

Similar findings of elevated levels of IL-6 GCF have been found in untreated aggressive patients (Mengel, Bacher, & Flores-De-Jacoby, 2002) and in women with stress-related depression and exhaustion (Johannsen et al., 2006, 2007). Maes (1995) suggested that stress causes alterations to both cellular and humoral immune responses and, as a consequence, impairs immunological defense mechanisms and promotes the accumulation of periodontopathogens, which in turn exacerbate periodontal diseases. The extent of inflammatory periodontal disease may be predicted by reactivity of the HPA axis and its effects on T-lymphocyte numbers during emotional stress (Breivik et al., 1996). Higher concentrations of hydrocortisone (cortisol) levels increased the expression of some matrix metalloproteinases (MMPs) in human fibroblasts (Cury et al., 2007), which could constitute a potential mechanism underlying

increased periodontal breakdown associated with psychosocial stress. In addition, stress can also affect the autonomic nervous system, resulting in secretion of catecholamines that affect the release of prostaglandin and proteases (Fibiger, Singer, & Miller, 1984) that in turn could cause periodontal tissue destruction.

Cortisol is a well-established stress biomarker and is regulated by the adrenocorticotrophic hormone (ACTH) from the pituitary gland. Cortisol levels reflect the activation of the HPA, which is considered an indicator of psychological stress (Kirschbaum & Hellhammer, 1994). Several studies have reported that cortisol levels in saliva and GCF are correlated with probing pocket depth (PPD), CAL, ABL, and with the extent and severity of periodontitis (Genco et al., 1999; Hilgert et al., 2006; Johannsen et al., 2006; Rosania et al., 2009; Rai et al., 2011; Haririan et al., 2012). Similar findings have also been reported by Ishisaka et al. (2007) who found a significant association between higher cortisol, dehydroepiandrosterone (DHEA, another type of cortisol) levels, and the number of teeth with PPD and CAL, using multiple regression analysis. This could be explained, at least in part, by the inhibitory effects of the activation on the HPA axis on the inflammatory immune response because all components of immune response are inhibited by cortisol (Chrousos, 1995).

This is in contrast to the study by Johannsen et al. (2007) who found decreased levels of cortisol in the GCF of depressed patients. This may be explained by the fact that the patient group was composed of a homogenous group exposed to prolonged work stress. Similar findings were reported from patients with atypical depression and posttraumatic stress, where a reduced reactivity of the HPA axis response was found (Gold & Chrousos, 2002; Rohleder et al., 2004). Furthermore, chronic stress has been associated with both increased and decreased HPA activity (Ockenfels et al., 1995). However, it is mostly increased levels of cortisol in periodontitis that were suggested to affect the immune system through the alteration of immunoglobulin and

neutrophil function (Genco et al., 1998; Rosania et al., 2009).

Another marker for stress is salivary chromogranin A (CgA) and α -amylase (AA), which are both supposed to link the activity of the neuroendocrine system with local and systemic immune function related to periodontitis (Wu et al., 2009; Zhang et al., 2009). A recent study from 2012 (Haririan et al.) found a significant correlation between salivary AA and CgA levels, and the number of teeth with pocket depth ≥ 5 mm, which was consistent with previous studies (Hironaka et al., 2008; Rai et al., 2011). These results suggest that CgA in particular plays a role in the communication between the neuroendocrine and immune system (Zhang et al., 2009), and a link to the local inflammatory reaction in severe periodontal disease. To clarify this association, further studies need to be performed.

Psychological stress has been shown to have an influence on several immune-mediated inflammatory diseases (IMIDs), including inflammatory bowel disease (Goodhand, Wahed, & Rampton, 2009), rheumatoid arthritis (Hyphantis et al., 2010), and psoriasis (Manolache, Petrescu-Seceleanu, & Benea, 2010). However, specific mechanisms for the negative influence have been clarified, although inadequate cortisol production related to systemic inflammation has been reported in patients with chronic arthritis (Straub et al., 2002; Capellino & Straub, 2008).

In addition, there are an extensive number of articles demonstrating that chronic stress has a negative influence on various forms of cardiovascular disease (see von Känel, 2012, for a review). There are probably a number of different mechanisms contributing to this, but recently, several studies indicated the role of increased inflammation (Steptoe, Hamer, & Chida, 2007). O'Donovan et al. (2012) showed that lifetime exposure to traumatic psychological stress was associated with elevated inflammatory markers, including a combination of plasma levels of IL-6, tumor necrosis factor- α (TNF- α), C-reactive protein (CRP), and resistin.

In summary, recent studies indicate that the net effect of psychological stress is hyperinflammatory rather than hypoinflammatory.

Oral Hygiene

Psychological factors lead to changes in the oral habits and in behavior responses of the host, such as poor hygiene (see Sheiham & Nicolau, 2005, for a review). Various studies have established a link between stressful life events and poor oral hygiene (Freeman & Goss, 1993; Monteiro da Silva et al., 1998). In 140 routine dental care patients, an association between higher sulcus bleeding index (SBI), number of missing teeth, dental avoidance, and stressful events such as somatization and depression were found (Klages, Weber, & Wehrbein, 2005). More recently, a study by Rosania et al. (2009) reported that oral care neglect during periods of stress were associated with CAL and missing teeth ($r = 0.27$; $p < 0.05$).

A relationship between neglect of oral hygiene (increased dental plaque and gingival inflammation) and academic stress is supported in several studies (Deinzer et al., 2001, 2005; Waschul et al., 2003; Johannsen, Bjurshamar, & Gustafsson, 2010).

Animal models using split-mouth design show that stress does not cause a local inflammation *per se* but will increase an already existing one. This suggests that immunological effects of stress together with oral hygiene neglect could have synergistic effects and thus increase the risk for tissue destruction in patients with an initial periodontitis.

Smoking

Smoking, known as the most important environmental factor, has been widely associated with periodontal and other systemic diseases, such as respiratory and cardiovascular diseases. The role of nicotine on stressed and depressed patients has also been studied. Individuals with nicotine dependence had higher rates of depression and anxiety disorder (see Hall et al., 1993,

for a review). Nicotine is recognized as a potent drug with acute and chronic central nervous system effects, including influences on mood. The mechanism of this relationship between biochemical alterations in the central nervous system and psychological depression is not clear. Pomerleau and Rosecrans (1989) proposed that sympathetic activation by nicotine was associated with an increase in norepinephrine release, and it has also been speculated that serotonin turnover in the hippocampus was significantly decreased by nicotine and associated with prolonged glucocorticoid hypersecretion (see Hall et al., 1993, for a review). In 1988, the Surgeon General's Report (U.S. Department of Health and Human Services, 1988) summarized that smoking was perceived to provide negative effect reduction, stress reduction, and positive

effect enhancement. Smoking was also a means to distract attention away from disturbing stimuli. The role of nicotine and other toxins in cigarette smoke in periodontal inflammation are still unclear (see Johannsen, Susin, & Gustafsson, 2012, for a review).

In vitro studies have shown that local administration of nicotine increases bone level in rats with ligature-induced periodontal inflammation (Nociti et al., 2000, 2001). Other animal models by Benatti et al. (2003), which included the administration of stress in rats, showed that the presence of stress significantly enhanced the effects of nicotine on periodontal disease, although stress did not affect periodontitis by itself. A recent community study (Chiou et al., 2010), including 1764 civilian noninstitutional Taiwanese individuals, assessed the effect of

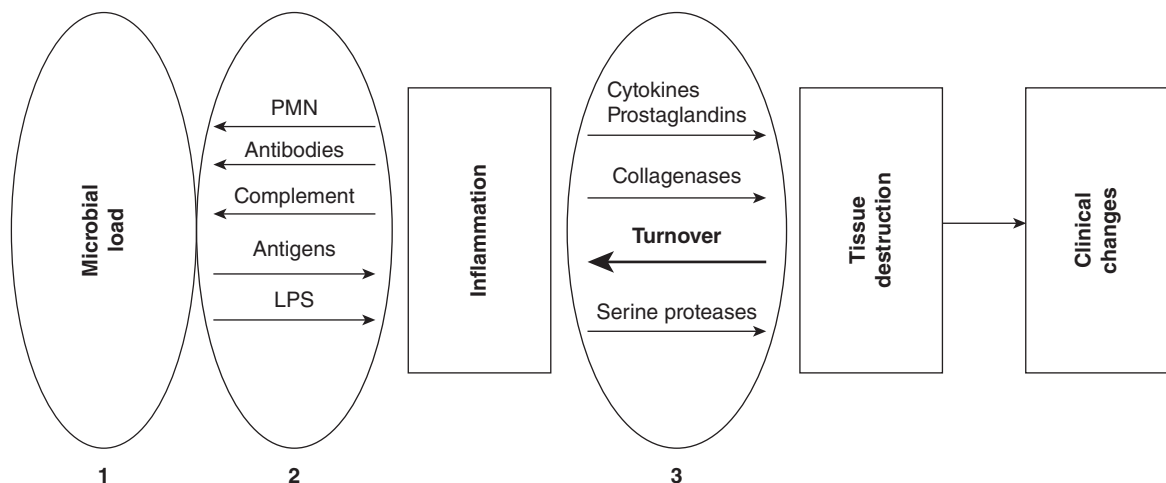


Fig. 3.1. Chronic psychological stress can modify the pathogenesis of periodontitis in several possible ways. (1) Stress causes changes in oral habits and in behavior, resulting in poor hygiene (Sheiham & Nicolau, 2005; Rosania et al., 2009). Poor oral hygiene leads to a more disease-associated microflora. (2) Activation of the hypothalamus-pituitary-adrenal axis (HPA-axis) could lead to a more T helper 2 cell (Th2)-dominated immune response. This results in a more humoral, antibody-producing immune response instead of a cell-mediated response. This could make the host more sensitive to infection with gram-negative bacteria and thus more susceptible to periodontitis (e.g., Breivik et al., 2000). (3) Chronic stress results not only in an increase of proinflammatory cytokines, primarily interleukin-6 (IL-6), but also increases in IL-1 β , IL-8, and tumor necrosis factor- α (TNF α) have been reported both locally (Giannopoulou et al., 2003; Kamma et al., 2004) and systemically (Steptoe et al., 2007; O'Donovan et al., 2012). Higher levels of proinflammatory cytokines will lead to a more pronounced inflammation and an increased risk for tissue destruction, at least in persons already having periodontitis. LPS, lipopolysaccharide; PMN, polymorphonuclear neutrophil granulocytes. Modified from Page and Kornman (1997).

periodontal status with psychosocial factors, including anxiety, depression and feelings of inadequacy, and smoking. Smokers with a higher score of psychosocial factors had significantly increased the CAL (OR = 2.49; 95% CI = 0.91–6.49) compared to nonsmokers (OR = 1.43; 95% CI = 0.76–2.58). These studies indicate synergistic effects of stress and smoking. The mechanisms causing the effects are not clarified, but both smoking and stress have been shown to decrease the defense against invading bacteria and simultaneously increase the inflammatory reaction (for a review, see Johannsen et al., 2012; Rohleder, 2012). Both effects could increase the risk for periodontal tissue degradation.

To conclude, stress and smoking might have a synergistic effect on the risk of developing periodontal disease. Therefore, preventive dental visits, compliance with oral hygiene regimens, and tobacco cessation should be actively promoted by the dental team.

Conclusions

Despite the above-mentioned limitations, a majority of the published studies on stress and periodontitis show a detrimental effect. The mechanisms for this effect are not yet clarified. Poor oral hygiene and smoking have been associated with psychological stress, but there are a number of studies that also, after compensation for confounders like visual plaque and smoking, show the detrimental effect of stress. The evidence is accumulating that chronic stress increases both systemic inflammation and local inflammation. Figure 3.1 shows possible influences on the pathogenesis of periodontitis that could explain the detrimental influence.

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4

Saliva in Health and Disease

Mahvash Navazesh

Key points

- Saliva plays a significant role in oral and systemic health.
- Multiple medical conditions and medications can impact the quality and quantity of saliva, leading to diminished quality of life.
- Xerostomia is subjective complaint of dry mouth. Salivary gland hypofunction is objective evidence of low saliva flow rates.
- Gene therapy may in the future be used for the management of radiation-induced salivary gland hypofunction.
- Fungal infection and dental caries are the most common complications of chronic salivary gland hypofunction.
- Oral healthcare providers can play a significant role in early detection of signs and symptoms of salivary gland hypofunction.

Introduction

The public and health professionals' image of saliva has changed drastically in recent years because of abundant information about the role of saliva in health and disease that is made available for public consumption via the Internet and the media. In the view of most people, saliva was created for licking envelopes and stamps. People rarely paid attention to saliva unless they were nervous, developed dry mouth, and had to deliver a public speech. Indeed, dry mouth caused by anxiety was used as a diagnostic aid by ancient societies in a lie detector test known as the *rice test* (Mandel, 1993). An accused was given a mouthful of dry rice to chew and swallow. If the accused was anxious because of guilt, the emotional inhibition of salivation resulting from increasing activity of the sympathetic nervous system would have interfered with adequate bolus formation and swallowing; it was interpreted as proof of wrongdoing and resulted in beheading of the accused. What used to be described as 99% water today is viewed as a fountain of information that reflects an individual's state of health and disease. The quality and quantity of saliva, like urine and blood, are affected by a variety of medical conditions and medications, as well as the psychological status of the patient. The public and professionals are used to blood and urine tests but not a saliva test as a routine practice for risk assessment and disease prevention. Although a saliva test is less invasive than a blood test, and needs less privacy than a urine test, it has not been part of the everyday practice of medicine and dentistry in the past. However, saliva diagnostic tests are becoming more readily available to and utilized by healthcare providers in recent years.

This chapter is written in an attempt to enhance awareness among oral healthcare providers of the role of saliva in health and disease and the significant role that they could play in the early detection and recognition of salivary

gland hypofunction, as well as the prevention of its associated complications.

Formation

Saliva is produced by three pairs of major glands and numerous minor salivary glands within the oral cavity. The parotid, submandibular, and sublingual salivary glands contribute to 90% of total saliva secretions. Minor salivary glands contribute to the remaining 10%. The saliva secreted by the major and minor glands collectively is referred to as whole saliva. In the resting (unstimulated) state, approximately two-thirds of the volume of whole saliva is produced by submandibular glands. Upon stimulation, the parotid glands account for at least 50% of whole saliva volume in the mouth. Sublingual glands contribute to a small percentage of unstimulated and stimulated whole saliva. Minor salivary glands contribute significantly to the lubrication of the oral mucosa because they contain a large amount of proteins. Unlike some minor salivary glands that are purely mucous in nature, parotid glands are purely serous and produce water-like secretions. Submandibular and sublingual glands are mixed. In general, the acinar (secretory) cells are responsible for production of primary saliva. The ductal cells are responsible for further modifications of saliva until it is secreted in the mouth. Saliva is 99% water and 1% proteins and salts. The normal daily production of saliva ranges from 0.5 to 1.5L. The average whole unstimulated saliva flow rate is approximately 0.3–0.4 mL/min. This rate may decrease to 0.1 mL/min during sleeping hours and increases to approximately 4.0–5.0 mL/min during eating, chewing, and other stimulating conditions. Saliva is always hypotonic to plasma. The higher the saliva flow rate, the greater the tonicity of saliva will be. Salivary gland secretion is mainly controlled by the autonomic nervous system. Parasympathetic stimulation produces copious (watery) saliva, whereas sympathetic

stimulation produces more viscous saliva (Bardow, Pedersen, & Nauntofte, 2004).

Function

Saliva plays a significant role in the protection of the intraoral structures against insults introduced by different microbial pathogens and chemical and mechanical irritants. The functions of saliva are listed in Table 4.1.

Saliva contains three buffer systems (bicarbonate, phosphate, and protein) and helps to maintain an acceptable pH in the range of 6.0–7.5 within the oral cavity. When a substance is placed in the oral cavity, the saliva flow will increase based on its taste, consistency, and concentration. When the volume of saliva is about 1.1 mL, the urge for swallowing will occur. The salivary stimulation, dilution of tastant, and swallowing will go on until the concentration of the tastants reaches a point where it no longer stimulates the flow rate. The oral clearance of different substances will be prolonged in the absence of saliva, leading to potential harm to intraoral hard and soft tissues. Saliva is supersaturated with respect to calcium hydroxyapatite under normal physiologic conditions, which prevents demineralization of the dentition. The salivary protein pellicle further protects teeth against irritants.

Human saliva contains α -amylase and lipase, which may play a role in starch digestion and triglyceride breakdown in neonates with pancreatic dysfunction. Salivary mucins play a significant role in lubricating the intraoral struc-

tures and serve as a barrier against microbial invasion. Lysozyme and lactoferrin are examples of other proteins with antimicrobial properties. Lactoferrin is believed to have antibacterial, antifungal, and antiviral properties. Salivary peroxidase has antibacterial properties, whereas histatins have been associated with antibacterial and antifungal properties. Salivary epidermal growth factor enhances the oral mucosal healing process and protects the oro-esophageal mucosa. In addition to these proteins with specific functions, saliva contains other organic components, such as glucose, urea, cortisol, sex hormones, and blood group substances, which have also been utilized in saliva as screening/diagnostic tools (Malamud & Rodriguez-Chavez, 2011).

Dysfunction

Multiple medical conditions and medications can affect the quality and quantity of saliva (Bergdahl, Bergdahl, & Johansson, 1997; Sreebny & Schwartz, 1997; Antilla, Knuuttila, & Sakki, 1998; Bergdahl & Bergdahl, 2000). This chapter will focus on the potentially common factors associated with chronic salivary gland hypofunction in adults (Table 4.2). Less frequent, uncommon, and/or acute conditions such as dehydration, salivary gland neoplasm, sialosis, sialadenosis, sialorrhea, sialolithiasis, and sialadenitis will not be covered here.

Salivary cortisol level is increased as a response of the adrenal cortex to stressors such as chronic dental anxiety, stressful computer task requirements, viewing anxiety-provoking videos, and masticatory muscle activity caused by clenching teeth. Relaxation modalities, such as viewing soothing videos, listening to music, and acupuncture treatment, could lower the saliva cortisol and amylase levels (Piollet et al., 1984; Benjamins, Asscheman, & Schuurs, 1992; Miluk-Kolasa et al., 1994; Bosch et al., 1996; Stones et al., 1999; Blom & Lundeborg, 2000; Hill & Walker, 2001; Neudeck, Jacoby, & Florin, 2001;

Table 4.1 Functions of Saliva

Buffering capacity
Remineralization of teeth
Lubrication capacity
Repair of soft tissues
Digestion
Antimicrobial capacity

Table 4.2 Common Chronic Conditions Associated with Salivary Gland Hypofunction and/or Xerostomia in Adults

-
- Medications
 - Anticholinergics
 - Antiemetics
 - Antidepressants (lithium, tricyclics)
 - Antihistamines
 - Antihypertensives
 - Antipsychotics
 - Antiretroviral therapy (protease inhibitors)
 - Decongestants
 - Appetite suppressants
 - Cytotoxic agents
 - Diuretics
 - Skeletal muscle relaxants
 - Irradiation
 - Chemotherapy
 - Medical conditions
 - Sjögren's syndrome, sarcoidosis, scleroderma
 - Viral infections (HIV, HCV)
 - Alzheimer's disease, depression, hypertension, uncontrolled diabetes
-

Brennan et al., 2002; Bakke et al., 2004; Hasegawa, Uozumi, & Ono, 2004; Takai et al., 2004; Hugo et al., 2008). As noted earlier, subjective dry mouth may have a psychological origin. Psychological processes are often accompanied by disturbed oral sensations and, in fact, most individuals have experienced dry mouth during a period of acute stress. Together with depression, mental stress has been reported to be associated with a dry mouth condition, either as a result of the illness itself or as an adverse effect of drugs used in the management of the psychological state (Davies & Gurland, 1961; Bolwig & Rafaelsen, 1972; Bergdahl et al., 1997). Stress may play a role, and the more anxiety there is, the lower the whole unstimulated saliva content of IgA. However, it has proved difficult to separate the effects of anxiety on salivary flow and immunoglobulin levels independently. These findings are in keeping with studies of saliva during daily relaxation. The secretory IgA rate

increased significantly after relaxation (Green, Green, & Santoro, 1988).

Studies of cortisol in depressed patients have given interesting results, provided technical aspects of steroid assays are controlled. In depression, there seem to be differences in salivary cortisol between patients with endogenous and nonendogenous depression. Generally, there is a correlation between plasma adrenocorticotrophic hormone (ACTH) levels and salivary cortisol, but this relationship is not present in patients with endogenous depression, suggesting either a drug effect or a disturbance of regulation of cortisol secretion (Galard et al., 1991). Self-induced vomiting and binge eating are features of bulimia nervosa. Saliva function has been studied in this group, and it is known that approximately 25% have sialadenosis (Roberts et al., 1989; Riad, Barton, & Wilson, 1991). Some studies have shown that parotid function is reduced in bulimics; that is, resting and stimulated flow rates are reduced in those with sialadenosis, and total protein and amylase levels are increased. Other studies of parotid and submandibular gland function have shown no difference in function in relation to controls, and amylase levels were equivalent.

Xerostomia is a common oral complaint associated with more than 500 medications (Sreebny & Schwartz, 1988). Polypharmacy is the most common cause of xerostomia (subjective complaint of dry mouth) and salivary gland hypofunction (objective evidence of reduced saliva flow rate) in the elderly. In May 2011, the U.S. Food and Drug Administration (FDA) added dry mouth to its consumer health information. The older population, those 65 years or older, represented 12.4% of the population in 2000 but are expected to grow to 19% by 2030. Approximately 80% of these individuals have at least one chronic medical condition, and 50% have at least two. Hypertension and heart diseases, diabetes, arthritis, and cancer are the most common medical conditions seen in older individuals. The most frequent types of medications with xerogenic potential are those with anticholinergic or sympathomimetic actions. Salivary gland

hypofunction is often an overlooked condition, and many patients who take xerogenic medications may not know that they are at risk for oral complications, such as dental caries and fungal infections. Therefore, the absence of a subjective complaint of oral dryness does not indicate adequate saliva production. Accordingly, the diagnosis of drug-induced hyposalivation requires measurements of saliva output or flow rate. In addition to the xerogenic medications taken by mouth, other chemotherapeutic modalities like chemotherapy and radiation therapy lead to qualitative and quantitative salivary changes. There is an association between the severity of salivary gland hypofunction and the degree of exposure to radiation. The management of oropharyngeal cancer often involves administration of 60-GY to 70-GY radiation that can lead to a 95% reduction in the amount of salivary secretions in the involved areas (Davies, Broadley, & Beighton, 2001). The severity of xerostomia and salivary gland hypofunction has also been associated with the total number of chemotherapeutic drugs used for the management of various malignancies.

Xerostomia is one of the most common complaints among patients who have undergone radiation therapy and/or chemotherapy (Grundmann, Mitchell, & Limesand, 2009; Jensen et al., 2010a,b). Unlike inflammatory changes associated with over-the-counter and prescription drugs that are temporary in nature, and could resolve on their own if the drugs are discontinued, the salivary changes associated with radiation and chemotherapy could be permanent. Chronic medical conditions could also affect the salivary flow rate and composition via different mechanisms. For example, in Sjögrens syndrome, an autoimmune disorder, the salivary gland tissue is replaced by inflammatory (CD4 T cell) lymphocytes leading to a dry mouth sensation caused by saliva hyposecretion (Fox & Stern, 2002; Vitali et al., 2002). In HIV-infected patients, the salivary glands may be affected because of tissue replacement by CD8 T cell infiltration as part of a diffuse, infiltrated lymphocytosis syndrome or due to persistent enlargement

of the parotid glands leading to dry mouth caused by HIV infection per se. In addition to the disease process, antiretroviral medications, such as protease inhibitors, independently increase the risk for xerostomia and salivary gland hypofunction in this patient population. Hepatitis C virus (HCV) may also lead to salivary gland disorders caused by lymphocytic infiltration (CD20 cells) (Mariette, Loiseau, & Morinet, 1995; Scott et al., 1997; Henderson et al., 2001; Loustaud Ratti et al., 2001; Ferreira et al., 2002). Patients with uncontrolled diabetes, depression, or Alzheimer's disease are also reported to experience salivary gland hypofunction and xerostomia (Ship et al., 1990; Sreebny et al., 1992; Lin et al., 2002; Hugo et al., 2008). However, the mechanism behind the salivary gland dysfunction in these patients may be more hormonal and neurogenic in nature than inflammatory. Xerostomia and salivary gland hypofunction, as stated before, are common in elderly adults. It is currently believed that the impact of aging on the function of the major salivary glands is of no clinical significance. In general, salivary gland function is age stable across the human life span in healthy adults. The frequent signs and symptoms associated with salivary gland hypofunction that are commonly seen in geriatric patients are caused by the medical conditions commonly seen in, and xerogenic medications often utilized by, this age group.

Complications

The most potentially common signs and symptoms associated with chronic salivary gland hypofunction and xerostomia are listed in Table 4.3. Infection and inflammation are the most common associated signs (Fig. 4.1). The quality of life has been reported to be reduced in patients with chronic salivary gland hypofunction (Jensen et al., 2010a,b). Since the patients may not present with any complaints, despite reduced saliva output, practitioners are often faced with irreversible complications in late stages of the disease. Chronic salivary gland hypofunction

Table 4.3 Common Signs and Symptoms Associated with Chronic Salivary Gland Hypofunction

Signs

- Dry, chapped lips; desiccated, dry, and fissured tongue
- Fungal infection (angular cheilitis/pseudomembranous and erythematous candidiasis)
- Dental caries (cervical and root caries in particular)
- Gingivitis
- Mucositis
- Traumatic oral lesions

Symptoms

- None (Often it may be asymptomatic)
- Difficulty swallowing, chewing, speaking, licking stamps, wearing lipsticks
- Bad taste, bad breath
- Sore mouth, lips, tongue
- Burning mouth, lips, tongue
- Difficulty wearing removable intra oral prostheses
- Frequent need to sip water with food
- Frequent awakening at night with dry mouth
- Dry mouth, nose, throat

increases susceptibility to coronal and root dental caries. A low saliva flow rate leads to a prolonged oral sugar clearance time and could lead to root surface caries. It also could increase the risk for the development of periodontal disease by promoting plaque and calculus formation. Fungal infection caused by *Candida albicans* is another example of a common infection in the presence of chronic salivary gland hypofunction (Pedersen et al., 1999). Figure 4.1 represents the clinical oral findings in a patient with severe salivary gland hypofunction.

Clinical Significance

Because saliva plays such an important role in the maintenance of oral and systemic health, it

is imperative to identify those individuals who are at risk for salivary gland hypofunction and prevent them from experiencing the possible associated complications. It is also critical to properly manage those who are affected by salivary gland hypofunction and attempt to eliminate the causative factors. The necessary steps to facilitate these processes are summarized in Figure 4.2.

Evaluation of salivary gland function should be included in the first visit for every new patient examination as well as ongoing observations during subsequent visits for care delivery. Regardless of presenting complaints, there are standard questions that could identify at-risk patients. The four questions listed in Figure 4.2 are some examples. The severity of any *yes* response to any of these questions could be further evaluated utilizing a 100-mm visual analog scale. During the medical history taking and review of systems, the presence, duration, and severity of any medical conditions and potential xerogenic medications should be documented. During clinical evaluation, the size, consistency, and response to palpation of salivary glands should be documented as well as changes involving other soft and hard tissue structures, such as dry lips, fissured tongue, carious teeth, or inflamed gingiva. Based on the subjective reports and objective findings, one may choose to perform further diagnostic tests such as sialometric, serologic, microbiologic, or histologic evaluations and imaging. Most of these diagnostic tests are known to healthcare providers. The least known test is sialometric evaluation and, therefore, it is discussed in detail later.

Unstimulated Saliva

Collecting whole saliva is easier and more cost-effective than collecting saliva from an individual gland (parotids, submandibular/sublingual) in a private practice setting. It is possible, of course, to collect from individual salivary glands by cannulation or, more conveniently, by using a Lashley or Curby cup (Lashley, 1999).

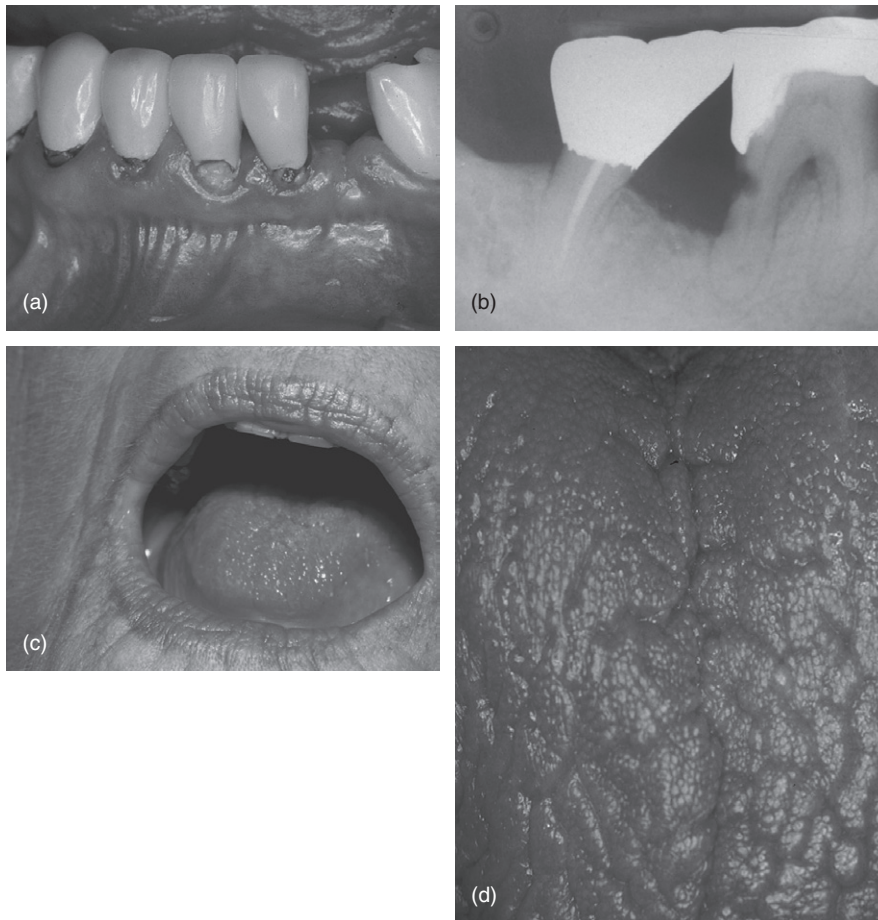


Fig. 4.1. (a and b) Clinical and radiographic evidence of recurrent dental caries and (c) dry lips and (d) tongue in a patient with chronic salivary gland hypofunction.

Whole saliva can be collected under unstimulated (resting) and stimulated conditions. Patients are instructed not to drink, eat, smoke, perform oral hygiene, or put anything into their mouths for 90 minutes before the collection time. The dentist or designated staff member collects the saliva in a quiet environment, with the patient sitting in an upright position, head tilted forward, and eyes open, with minimal body and orofacial movements. The patient is asked to swallow saliva first, then stay motionless and allow the saliva to drain passively for 5 minutes over the lower lip into a

preweighed test tube fitted with a funnel. After the 5-minute collection period, the patient is asked to void the mouth of saliva by spitting into a funnel.

Stimulated Saliva

The clinician then collects stimulated saliva by asking the patient to chew on a piece of unflavored gum base at approximately 70 chews per minute. The patient will void the mouth of saliva by spitting into the collection tube every minute for a total of five5 minutes. The clinician

Identifying patients with or at risk for salivary gland hypofunction.

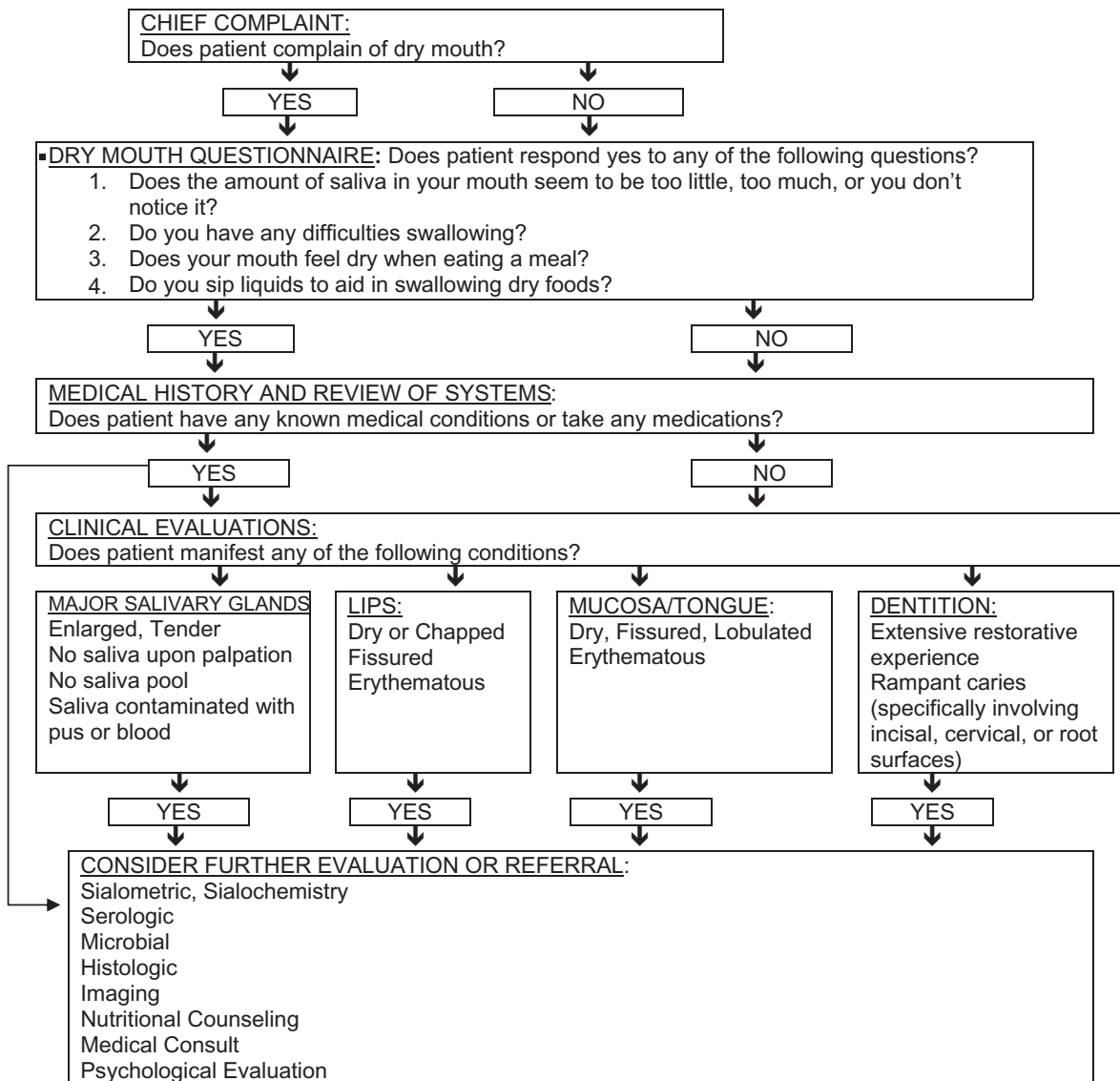


Fig. 4.2. Identifying patients with or at risk for salivary gland hypofunction. Adapted with permission from the publisher by Navazesh et al., 2002.

then calculates the salivary flow rate by dividing the amount (weight or volume) of collected saliva by the duration of the collected period (5 minutes). There is no general agreement about what constitutes a normal salivary flow rate;

however, scientists generally consider an unstimulated flow rate of less than or equal to 0.1 mL per minute (or grams per minute) and a chewing-stimulated flow rate of less than 0.7 mL/min (or g/min) for men and less than

0.5 mL/min for women to be abnormally low (Navazesh & Kumar, 2008).

The management of patients with salivary gland hypofunction may include enhancement of daily oral hygiene, regular oral professional evaluations and care, hydration, lubrication, stimulation of salivary glands, nutritional counseling, and avoidance of irritants such as alcohol, tobacco, and sugar-containing salivary stimulants and prescription of medications such as pilocarpine hydrochloride (Salagen) and cevimeline hydrochloride (Evxac).

Gene therapy in animal models has also been investigated in recent years for the management of salivary gland dysfunction caused by irradiation to the head and neck areas. The ductal cells of the salivary glands are genetically reengineered and transformed to fluid-producing cells via gene therapy. More recently, gene therapy has been utilized for the management of Sjogren's syndrome in an animal model (Kok et al., 2003). An immunomodulatory gene delivered locally to the salivary glands is shown to be effective in lowering the inflammatory response and limiting the functional damage induced by the inflammatory process. The clinical application of gene therapy for the management of salivary gland dysfunction in humans will be invaluable and a reality in the future (Cotrim & Baum, 2008).

Current Diagnostic Values and Future Directions

Qualitative and quantitative changes of saliva may be utilized for the detection of and exposure to chemicals and pathogens or quantification of the severity of or susceptibility to different conditions (Tabak, 2001; Kaufman & Lamster, 2002). For example, the salivary levels of alcohol (ethanol), tobacco (nicotine, cotinine), cocaine, marijuana, opiate, and methadone correspond well with their concentrations in serum and are utilized as screening tools by insurance companies and law enforcement agencies to evaluate possible exposure to these chemicals. The pres-

ence in saliva of antigens or antibodies of the pathogens, such as HIV-1, HIV-2, hepatitis A, B, C, measles, mumps, or rubella, may be used to evaluate possible exposure to these pathogens. Salivary levels of microorganisms (*Streptococcus mutans* and *Lactobacillus acidophilus*) and *C. albicans* are routinely used to assess susceptibility to dental caries and oral candidiasis, respectively (Kaufman & Lamster, 2000; Fox, 2004). Saliva could also be used to monitor disease progression and response to pharmacotherapeutic agents. Insulin, cortisol, aldosterone, estrogen, progesterone, lithium, theophylline, and caffeine are some examples. Potential salivary biomarkers for diabetes, ovarian cancer, breast cancer, oral cancer, preterm labor, and exposure to the coronavirus in severe acute respiratory syndrome (SARS) have been the focus of scholarly activities by multiple scientists in recent years (Wong, 2008; Zhang, Xiao, & Wong, 2009; Xiao & Wong, 2011). With the remarkable advances in the areas of gene therapy (Voutetakis et al., 2004), microarray chip technology, and gene mapping, saliva will continue to serve as a fountain of opportunity for the advancement of science, and for risk assessment, disease prevention, and therapeutic modalities. When one licks an envelope or a stamp, a much more detailed message is transmitted than meets the eye.

For further information, the readers are encouraged to visit the following sites:

<http://www.ada.org>
<http://www.nci.gov>
<http://www.cdc.gov>
<http://www.nidcr.nih.gov>
<http://www.sjogrens.org>

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5 Surface EMG Biofeedback in Assessment and Functional Muscle Reeducation

Bruce Mehler

Key points

- Surface electromyography (sEMG) is a painless and noninvasive method of monitoring muscle activity and resting tonus that can be used both in assessment and training applications.
- Biofeedback techniques may be applied both for general relaxation training and in retraining of functional patterns of muscle activation.
- An understanding of the basic principles of sEMG technique can significantly enhance recording quality and utility.

Introduction

Surface electromyographic biofeedback employs noninvasive instrumentation to monitor subtle changes in muscle physiology and present that information to a patient to assist them in learning to modify muscular activity and resting tonus in a desired direction. Train-

ing goals may range from general relaxation of the masticatory and other muscles of the face, neck, and shoulders to functional muscle reeducation aimed at establishing a more normal bite pattern. In this learning environment, the clinician frequently assumes the role of a coach, helping the patient understand (discriminate) feedback information, sometimes suggesting

strategies to employ to move in the desired direction, providing encouragement (reinforcement) for targeted behavior, and adjusting training goals (shaping) as needed. As can be inferred from these terms, the rational basis for biofeedback derives from the field of learning theory and behavior modification.

The biofeedback process can also be seen as a form of three-party social interaction in which the instrument not only provides information, but it also inserts another party (the biofeedback device) into the evaluative process. This can be useful in situations where the patient has difficulty learning the task; the clinician does not have to take on the role of “judging” the patient, telling them they have to relax, but instead the clinician can become an ally who assists the patient in trying to learn from the feedback provided by the machine. Between sessions, the patient is encouraged to rehearse/practice the desired behavior. At the next session, the instrumentation provides a means of obtaining objective information on how much progress the patient has made. The goal of this learning process is to produce a relatively permanent change in behavior that becomes internalized such that feedback from the instrumentation is no longer needed to produce or maintain the behavior.

Current surface electromyography (sEMG) monitoring and clinical biofeedback instrumentation provide healthcare professionals with tools that can be utilized in a range of assessment and treatment tasks. The manner in which these instruments are utilized will vary based on the perspective, training, and role a particular clinician plays in the overall care of the dental patient. Thus, in one practice, the primary practitioner may use the instrumentation directly, while in others, trained auxiliary staff or allied health professionals may employ them. Similarly, an instrument that monitors muscle activity may be used in one setting primarily as a biofeedback device to aid in relaxation training while it is utilized in another clinic largely as an assessment tool or in muscle reeducation.

Fundamental to a behavioral approach to health care is the concept of assessment. How can one propose to modify a system without first establishing the characteristics of the system? While this may seem like a statement of the obvious, it is an important perspective to keep in mind when developing a treatment plan, particularly in complex presentations as may be the case in myofascial pain disorder (MPD) or temporomandibular disorder (TMD). For example, careful assessment of a complaint of jaw pain may reveal heightened reactivity to emotional stimuli in one patient, suggesting possible roles for biofeedback-assisted relaxation training and stress management counseling. In another individual, the history may not indicate any significant anxiety or stress-related issues, and functional assessment may not reveal any remarkable reactivity to emotional stimuli. On the other hand, this patient may show clear patterns of dysfunctional muscle activation during normal jaw opening and clenching activities, suggesting a role for feedback-assisted retraining of muscle recruitment patterns. As these brief examples suggest, biofeedback instrumentation can play as important a role in assessment as it does in actual treatment.

This chapter is intended to provide an introduction to some of the established and emerging applications of sEMG instrumentation in dental practice, as well as discussing factors in the selection and effective utilization of this instrumentation. Some of the technical material presented, such as the discussion of electromyography (EMG) quantification and frequency characteristics, are not typically covered in introductory presentations and may appear a bit intimidating at first to some readers. However, it is the author’s opinion that the basic “take-away” messages in each of these sections are straightforward and can be made quite accessible. Mastery of the essentials of biofeedback is well within the capability of dentists and/or appropriately trained assistants who are effectively already involved in behavioral modification/educational activities with

patients on a daily basis. (See Dworkin's (2007) discussion of role of the dentist and the dental healthcare team in the delivery of biobehavioral modalities.) Opportunities to obtain "hands-on" experience with the concepts and techniques presented here are generally available through specialized short courses offered at various professional society meetings and other venues.

Historical Development

The roots of biofeedback can be traced back to a number of sources; however, one of the seminal papers in modern biofeedback was Budyanski and Stoyva's (1969) publication on a method to produce deep muscle relaxation by means of "analog information feedback." Muscle activity was recorded from the region of the frontalis muscles using sEMG, and subjects were instructed to close their eyes and relax as deeply as they could, particularly the muscles of the forehead. The experimental group was presented with an auditory tone that decreased in pitch as muscle activity decreased, and they were further instructed to keep the pitch of the tone low. One control group was presented with a constant low tone unrelated to their level of muscle activity and were told that the monotonous tone would help them relax. A second control group was not presented with a tone and simply instructed to relax. The active feedback group showed the greatest success at lowering muscle activity, supporting the author's contention that providing individuals with feedback about their instantaneous level of muscle activity would be more successful in producing a relaxed state than simply asking an individual to relax.

Budyanski and Stoyva (1973) went on to extend their method to examine both auditory and visual feedback and the training of the masseter muscles. They outlined a shaping technique to produce gradual relaxation by successive approximations to the deeply relaxed state. They proposed that graduated training

steps are likely to reduce the chance of error which may occur if a training goal is set too large. Eighty males were divided into 4 groups of 20. Two experimental groups received the shaping method with biofeedback using either an auditory tone or a visual signal. An irrelevant, steady, low-tone control group and a silent (no-tone) group were again used as control conditions. The active biofeedback groups showed a deeper level of muscle relaxation in the target muscles than the control groups. The level of muscle relaxation achieved by the auditory and visual feedback groups was not statistically different, indicating that both forms of informational feedback were effective. In this paper, Budyanski and Stoyva proposed that this methodology might be particularly useful in dentistry in the treatment of myofascial pain dysfunction syndrome where excessive muscle activity is present and also proposed potential applications of the instrumentation in the treatment of bruxism.

Dental Relevant Applications

Budyanski and Stoyva's work was followed by clinical reports by Carlsson, Gale, and Ohman (1975) and by Gessel (1975) on the use of EMG biofeedback in TMDs and by Cannistraci (1976) on biofeedback training and bruxism. By 1979, Buonomano and Buonomano had published an expansive article in *General Dentistry* entitled "Biofeedback: The Emergence of a New Dental and Medical Perspective." Most major texts on biofeedback now include discussions on applications with dental patients (e.g., Cannistraci & Fritz, 1989; Glaros & Lausten, 2003). A role for sEMG as a modality in the context of biofeedback-assisted relaxation training and in muscle reeducation is now generally recognized by most relevant professions. A 1982 American Dental Association (ADA) President's Conference concluded that EMG biofeedback had reasonable scientific support and could be recommended for TMD cases involving the muscles

of mastication; this position was reaffirmed in an ADA-affiliated follow-up review (Mohl et al., 1990). The status of sEMG as an assessment modality for diagnosis in dentistry is, however, still somewhat controversial and will be addressed later in this chapter.

The listing that follows provides a clinically oriented conceptual grouping of the ways in which biofeedback techniques are most commonly employed with dental patients:

- Biofeedback-assisted relaxation/desensitization training for dental anxiety/phobia (e.g., Berggren & Carlsson, 1984; Lundgren, Carlsson, & Berggren, 2006)
- Biofeedback-assisted relaxation training within the context of stress management/emotional reactivity training for stress-related TMD symptoms (see citations throughout this chapter, particularly the section reviewing efficacy studies)
- Biofeedback-assisted training to improve patterns of muscle activation/balance at rest and during masticatory activity (see citations throughout this chapter)
- Biofeedback-assisted muscle training to accommodate dental appliances/bite guards (Kasman, Cram, & Wolf, 1998; Mahony, 2010).

Some of the above-mentioned topic areas, such as dental fear and anxiety, are covered in depth in other chapters of this book. The use of sEMG as part of a nocturnal alarm system in the treatment of bruxism has shown some success but also has limitations (see Chapter 11 on bruxism by Glaros and Hanson).

Biofeedback in Clinical Practice

A feedback device can be as simple as a mirror that is used to visually demonstrate to a patient when one shoulder is being held higher than another and when they are in balance. But typically, biofeedback devices are electronic instruments that can detect extremely small physiological changes and provide direct feed-

back (information) about activity in the form of visual or auditory signals. Biofeedback devices may be relatively basic instruments that indicate physiological changes by means of a moving needle or a simple tone that changes in pitch as a physiological variable changes. Alternatively, computer-based systems are available that monitor multiple muscle sites, or a range of physiological parameters, at the same time and provide detailed visual and auditory display options. Computer-based systems may also offer extensive data reduction and report generation capabilities.

In some instances, the feedback may be indirect, where the clinician observes the instrument and provides the patient with cues indicating whether activity is moving in a desired or non-desired direction. More commonly in dental practice, the meaning of the feedback signal is simply explained (i.e., “when the line on the computer display goes down, this indicates lower muscle tension”), and suggestions are provided to start the feedback process (“try slowing your breathing, allow your jaw to drop, and observe what happens on the display”). If two muscles are being monitored, they may be represented as different colored lines or as bars. Biofeedback displays can be quite engaging, and some patients will respond to a visual display of unbalanced bilateral masseter or trapezius activity by immediately trying to bring the two signals into balance. Other patients will require more active guidance. For an extended consideration of biofeedback principles and clinical technique, the edited volumes by Basmajian (1989) and Schwartz and Andrasik (2003) are standard references. Chapters in edited texts specifically on biofeedback applications in dental patients include Cannistraci and Fritz (1989), Hudzinski and Lawrence (1990), and Glaros and Lausten (2003); see also chapter 9 in Kasman et al. (1998). Another source of information and professional support is the web site of the Association for Applied Psychophysiology and Biofeedback (<http://www.aapb.org>).

In situations where a major component of the treatment plan is to teach a patient to relax

specific muscles, or to lower their arousal generally, it is often advantageous to combine some basic form of relaxation training with biofeedback. In fact, some professionals prefer to talk about the biofeedback work they engage in as “instrument-assisted relaxation training.” There are many approaches to relaxation training ranging from progressive muscle relaxation to techniques involving varying emphasis on the use of imagery, breathing, autogenic phrasing, or hypnotic suggestion. There are numerous sources for guidance on clinically oriented relaxation training; Lehrer, Woolfolk, and Sime (2007) and Turk, Meichenbaum, and Genest (1983) are excellent resources. An introduction to relaxation can be provided by a primary clinician or appropriately trained auxiliary staff member. Alternatively, there are a wide range of commercially available audio programs that can be successfully used as part of a relaxation training program (see Schwartz (2003) for a discussion on the use of audiotapes for relaxation training). However, an important caution should be kept in mind. Occasionally, a patient may be encountered with various psychological issues who may become uncomfortable if they attempt to relax. While it may ultimately be to the patient’s advantage that such anxiety is discovered and dealt with (either through appropriate support or referral), it is suggested as a general rule of practice that patients who appear unusually anxious or who otherwise seem uncomfortable with the idea of relaxation training should not be left alone with a training tape or a biofeedback device; an observer should be present to provide guidance as needed. See Schwartz, Schwartz, and Monastera (2003) for a discussion of possible negative reactions to relaxation and biofeedback-assisted relaxation training and guidelines for minimizing and managing such situations.

The question is sometimes posed as to whether a particular relaxation training technique or biofeedback is more effective as a treatment modality. Based on clinical experience, and a review of the research literature, it can be argued that in many situations, it is the combi-

nation of relaxation training and biofeedback that is the most effective. For many patients, biofeedback monitoring during (or before and after) a relaxation training session helps to demonstrate that the relaxation training procedure is producing a measurable change in their body. This may be the crucial step in helping a patient “buy into” the prescription that they practice the relaxation procedure outside of the clinic. In a similar fashion, knowing that their progress is going to be visible on the biofeedback device influences the motivation of some patients to practice at home between clinic sessions since their progress can be objectively monitored.

Budyanski and Stoyva’s (1973) emphasis on using a shaping procedure to train patients through a process of successive approximations to the eventual goal of muscle relaxation is a key aspect of applied learning theory. It is now well recognized that learning can be accelerated through positive reinforcement. In humans, simply meeting a goal of lowering the tone of a biofeedback instrument or dropping the signal representing muscle activity below a threshold line displayed on a computer screen can be an effective source of positive reinforcement. Positive reinforcement is most likely to occur if initial training goals are set to be relatively easy. Once an initial easy goal is met, the training goal can be modestly increased.

A common reaction when an individual is first asked to attend to the biofeedback signal and to relax is for them to actually become somewhat more tense. This can be interpreted as an understandable form of performance anxiety since their behavior is readily observable through the feedback signal. This response pattern can be mitigated in part by predicting for the patient in advance that they may find the signal going in the opposite direction at first. Consider advising the patient that it is not particularly important if the signal increases or decreases during the early part of the training session—what is important is paying close attention to what they feel like or what they are thinking about when the signal increases and, similarly, to pay close attention to what they are

feeling or are thinking when the signal decreases. Emphasize that developing an awareness of what may be subtle changes in muscle tension is the initial training goal. As the patient becomes more comfortable with observing their own behavior, the shift to a goal of actually decreasing sEMG activity can be made. Similarly, it can often be useful to have a patient initially “play” with the biofeedback signal, deliberately increasing muscle activity to watch the signal change and then letting the tension go.

In the late 1970s/early 1980s, the author was the lead software developer of what became one of the first commercially available computerized biofeedback systems. Some of the aforementioned principles were built into an automated goal-setting algorithm. Following an initial set-up period when signal quality could be checked, visual display ranges adjusted, and during which the patient could “play” with the signal before formal data collection began, patients were instructed to relax comfortably while a resting baseline reading of muscle activity was obtained. In cases of muscle relaxation training, at the completion of the baseline period, the initial training goal was set to be 105% of the mean baseline sEMG reading. On a computer display screen where up corresponded to increased sEMG activity and down to decreased activity, this meant that a threshold or goal line was drawn on the screen that was 5% higher than the mean level of muscle activity present during the baseline recording period. In these circumstances, even if the patient were to tense a little, they had a reasonable probability of being at or below the training goal at some point during the initial training trial, that is, of receiving some positive reinforcement. Trials were typically relatively short, often 1 minute in duration. Training goals were reassessed at the end of each trial. Performance was calculated as the percent time during a trial that the patient was at or below the training goal. If the patient met the goal less than half the time, the goal was classified as too hard and adjusted. If the patient was able to keep sEMG activity at or below the goal line between 50% and 90% of

the time, the goal was kept at the same value. The training goal was only made more challenging when the patient showed relative mastery of the task by meeting goal greater than 90% of the trial. Based on the shaping principle, new goals were set to be halfway between the current goal and the patient’s mean sEMG level for the just-completed trial. In this manner, the new goal was adapted based on the patient’s performance level. When working with non-computerized biofeedback equipment, or with systems that do not employ a similar automated training algorithm, a clinician can manually adjust training goals following the same basic principles.

In addition to the direct benefit of learning to relax overly tense muscles, biofeedback training can have important indirect effects as well. Chronic pain conditions can lead to a sense of loss of control, which may be associated with increased anxiety, secondary muscle tensing, and even depression. When a patient observes through the feedback process that he or she can voluntarily reduce muscle tension even a little, this can lead to an increased sense of control. This in turn can reduce anxiety, stress, secondary tensing, and even have a mitigating effect on depressive symptoms.

For some patients, the awareness training component of a biofeedback experience may, in some ways, be more important than the absolute level of muscle relaxation they can generate in the clinical setting. If this awareness training results in a patient becoming aware early on of when they are starting to tense muscles during the course of the day, it is much easier to attend to and think about releasing tension at that point than it is to try to relax muscles after tension has built up to the point that muscles go into spasm, trigger a headache, and so on.

While the most straightforward application of sEMG-based biofeedback training is to focus on relaxation of overly tense muscles as in Budyznski and Stoyva’s initial studies, the question of which muscles to train and for what reason should be carefully considered if

maximal success is to be obtained. Selection of appropriate muscles of interest is discussed in several sections of this chapter.

Efficacy Evaluations of Biofeedback in the Treatment of TMD Disorders

Most experimental research on biofeedback-assisted treatment of TMD disorders has focused on muscle relaxation training, although a few studies may have included muscle balance reeducation in addition to relaxation work. Crider and Glaros (1999) examined outcome evaluations of treatments performed with sEMG to determine the efficacy of these studies and to estimate treatment effect size. Thirteen studies of sEMG biofeedback treatment for TMD were analyzed, consisting of 6 controlled, 4 comparative treatment, and 3 uncontrolled trials. Three types of outcome data were used: pain reports, clinical exam findings, and ratings of global improvement.

Five of the six controlled trials found sEMG biofeedback treatments to be superior to no treatment or psychological placebo controls for at least one of the three types of outcome. Data from 12 studies contributed to a meta-analysis that compared pre- to posttreatment effect sizes for EMG biofeedback treatments to effect sizes for control conditions. Mean effect sizes for both reported pain and clinical exam outcomes were substantially larger for biofeedback treatments than for control conditions. In addition, 69% of patients who received sEMG biofeedback treatments were rated as symptom-free, or significantly improved, compared with 35% of patients treated with a variety of placebo interventions. Follow-up outcomes for sEMG biofeedback treatments showed no deterioration from post-treatment levels. The authors concluded that the outcomes of these studies support the efficacy of sEMG of biofeedback treatments for TMD. A more recent review by these authors (Crider, Glaros, & Gevirtz, 2005) comes to the same conclusion.

Another meta-analysis (51 studies) was performed by Fernandez and Turk (1989). They concluded that the results supported the view that there are long-term advantages when using cognitive behavioral skills training (CBST) over other dental or pharmacological techniques in managing TMD-related pain. Flor and Birbaumer (1993) compared CBST, biofeedback, and conservative medical treatment in chronic back and TMD. Treatment with biofeedback produced the most change. At 6 and 24 months, only the biofeedback group maintained the significant decrease in pain severity.

Gardea, Gatchel, and Mishra (2001) ran a study that eliminated many shortcomings in earlier research. Chronic patients were assigned to one of three biobehavioral treatment groups—biofeedback, CBST, a combination of biofeedback and CBST, or a no-treatment comparison group. A 1-year follow-up was conducted. The major finding was that for pain scores, the biofeedback and combined groups showed the greatest improvement. The combined group showed the greatest improvement on pain-related disability. The 1-year follow-up showed that the biofeedback group was most effective in reducing TMD pain.

Dahlstrom (1989), in an exhaustive review, examined 12 studies that used sEMG. In one of the earliest (Carlsson & Gale, 1977), 11 temporomandibular joint (TMJ) patients were treated for from six to eight sessions and eight patients were reported to show significant improvement. Dohrman and Laskin (1978) treated 16 MPD patients with masseter muscle biofeedback training and 8 patients with “placebo feedback.” Mean levels of masseter activity were significantly reduced in patients in the experimental group. Only one biofeedback patient required further treatment while five of the eight controls required additional intervention. In another study (Stenn, Mothersill, & Brooke, 1979), masseter activity was measured in 11 patients with long-standing symptoms. Six were given masseter biofeedback with relaxation training for eight sessions. The remaining five were given relaxation training and

masseter activity recorded with no feedback. All patients also received cognitive behavior modification. A significant reduction of masseter activity in all subjects occurred with no difference between groups. There was a significant reduction in number of symptoms and signs of MPD in all subjects. This study shows that multiple modes of therapy increase the probability of successful treatment; at the same time, if evaluated as independent therapies, biofeedback alone appeared to be the most effective.

Just as combined relaxation and biofeedback techniques may be superior to either alone, integrating biofeedback training with other conservative dental procedures may be advantageous. Turk, Hussein, and Rudy (1993) conducted two studies evaluating the effect of a biofeedback/stress management (BF/SM) treatment program and treatment with an intraoral appliance (IA), first separately and the second in combination. In the first study, the IA treatment was initially more effective in reducing pain. However, at a 6-month follow-up, the IA group showed significant relapse, particularly in depression, while the BF/SM group maintained and showed further improvement in both pain and depression indices. The use of an IA and BF/SM treatment was combined in the second study. It was reported that the combined treatment was more effective than either alone, especially in pain reduction at the 6-month follow-up. The authors concluded that the results supported the value of using both dental and psychological (behavioral) treatments to successfully treat TMD patients if treatment gains are to be maintained.

A number of conservative reviews by individuals and groups not professionally invested in the application of biofeedback techniques have concluded that the literature supports the position that relaxation techniques including biofeedback may be effective in treating TMDs (Mohl et al., 1990; Medlicott & Harris, 2006; Scrivani, Keith, & Kaban, 2008).

Summary points on clinical training:

- Introducing some form of relaxation training along with feedback from a physiological

monitoring instrument is often found to be more effective than either procedure alone.

- When the goal is to learn to relax muscles, having the patient first practice gently increasing and then releasing muscle tension may be more effective than having them begin by immediately trying to decrease muscle activity.
- Initial training goals should be modest so that a patient has a high probability of obtaining positive reinforcement. Goals can be made progressively more challenging through a shaping procedure.
- The development of increased awareness of relative levels of muscle tension may be as significant for some patients as the absolute level of relaxation obtained during in-clinic training sessions.
- Similarly, in cases where there is a significant imbalance bilaterally in a set of muscles, bringing the left and right sides into approximate balance and then focusing on decreasing general muscle activity may be more important than dramatically decreasing sEMG activity on a single side.

EMG as a Measure of Muscle Activity

EMG measures muscle activity by detecting changes in electrical potential that are associated with muscle action potentials. Muscle action potentials are similar to the action potentials that are generated in nerve cells, involving rapid changes in the relative concentrations of ionic charges across the cell membrane. When a motor neuron stimulates a muscle fiber, a wave of depolarization propagates bidirectionally along the length of the fiber, resulting in a cascade of molecular interactions that cause the fiber to contract. Muscle activity, such as the contraction of the masseter muscle to close the jaw, is the result of the summed activity of many muscle fibers. The overall strength of a muscle contraction is a function both of the number of fibers recruited and the frequency of firing of individual fibers.

sEMG is a noninvasive technique that places relatively large recording electrodes on the surface of the skin over a muscle or muscles of interest. Like fine-wire EMG, sEMG provides a measure of the summed electrical activity of groups of muscle fibers, but does so for a much larger area of muscle and without the discomfort and complications of inserting a lead through the skin. With proper instrumentation and recording technique, sEMG is a highly reliable measure of muscle activity across repetitions and testing days, obtaining reliability coefficients superior to that of invasive wire EMG recordings (Komi & Buskirk, 1970; Giroux & Lamontagne, 1990) and providing more information about functional activity level (Sihvonen et al., 1991). It should be noted that sEMG does have some limitations in that it cannot detect activity in deep muscle groups except when contractions from these groups are relatively strong (Wolf et al., 1991). Thus, while sEMG techniques readily record activity from muscle groups such as the masseter and anterior temporalis, low-level activity from overlaid muscles such as the pterygoid is more difficult to monitor. Fine-wire recordings remain quite useful in research for developing an understanding of the subtle features of recruitment patterns with a given muscle, such as Van Eijden, Blanksma, and Brugman's (1993) investigation of the masseter.

Detecting the EMG Signal

The magnitude of the EMG signal that appears at the surface of the skin is extremely low when compared to the forms of electrical energy encountered in everyday settings. A fully charged standard flashlight battery has a rated electrical potential of 1.5V. In comparison, a surface EMG reading from the forearm of a relaxed individual might be measured at $1.5\mu\text{V}$, one millionth the voltage of the flashlight battery. Besides this low-level electrical activity from muscle at the skin surface, external sources of electrical activity may also be present. These other sources are referred to as "noise" and

include radio frequency waves (from radio and television stations, cell phones, and microwaves) and interference from power-line sources (fluorescent lights, dimmer switches, heating units, air conditioner motors, and X-ray machine power supplies). These additional sources of electrical signals may be present at the level of several hundred microvolts, easily masking muscle activity. As late as the 1960s and 1970s, quality sEMG recordings were typically carried out in special wire mesh enclosures to shield the subject from these external noise sources. Advances in electronics and instrumentation design have allowed sEMG recording to move out of the laboratory to become a practical measure that can be carried out in most office settings. A basic understanding of some of these features is important in determining the suitability of an sEMG unit for various dental applications. Proper clinical technique can significantly impact the quality of sEMG recordings. Both issues are addressed in the following sections.

Surface EMG Sensors and Recording Techniques

Sensor Placement

Most modern surface EMG systems are based on a differential amplifier design that involves the placement of two active (sensing) contacts on the surface of skin over the muscle of interest. Ideally, the two active contacts should be positioned so that an imaginary line drawn between them runs in parallel with the orientation of the muscle fibers. This can be observed in Figure 5.1 where the muscle fibers for the masseter and temporalis muscles are indicated by dashed lines and the location for the two active contacts are shown as black circles. Figure 5.2 shows actual sensor placements for the masseter muscle. Note the arrows on the disposable electrode patch indicating the general orientation of masseter muscle fibers. Since the muscle action potentials propagate along the length of the muscle fiber, the instantaneous electrical potential will differ at two points along the

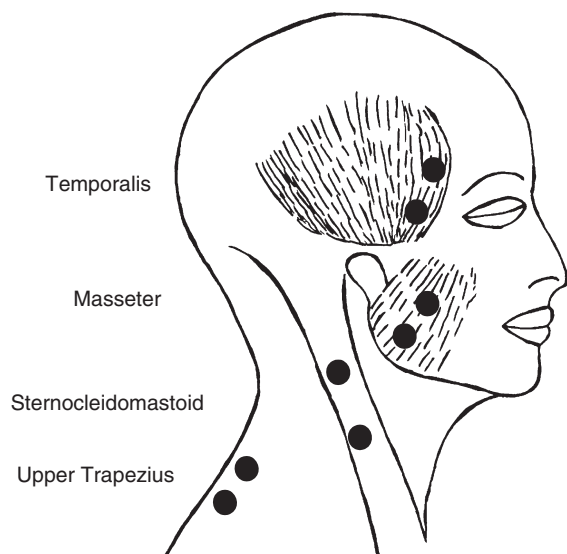


Fig. 5.1. Four discrete muscle recording sites are shown. For specificity of recording, the two active contacts (black circles) should be oriented along a line parallel to the muscle fibers of interest. Specificity is also influenced by the distance between the active contacts. Placing them close together limits recording activity to a region extending out from each contact point approximately equal to the distance between the two active contacts. Moving the contacts farther apart results in a more generalized recording area that incorporates more activity from surrounding muscles. Reference (ground) electrode(s) are not shown.

length of the muscle at any given moment in time, while the signal from external electrical noise sources will tend to be at the same level at both points. The EMG instrument cancels out (subtracts) the signal that is common at the two points (the noise component) and amplifies the remaining (differential) signal that represents muscle activity. If the active contacts are placed perpendicular (across the muscle fibers), the temporal characteristics of the EMG signal at the two points will be similar, and some of the muscle signal will be canceled along with the external noise sources.

A third contact, known as the reference, is generally placed an equal distance from the two

active contacts. The reference is either placed over the muscle of interest or on a more distant, electrically neutral location such as over the mastoid behind the ear or on the earlobe. Examples of two options for placement of the reference contact to record activity from the temporalis are illustrated in Figure 5.3a,b. Alternate terms for the third contact are “ground,” which dates back to the time when electrical recording devices were literally grounded to the earth, and “common,” since the electrical activity from both active contact points are referenced to this common location. Multichannel instruments (units that are designed to measure activity from more than one muscle at a time) may use a single reference contact for the entire system or may utilize a reference sensor for each pair of active contacts.

Preamplified Sensors

Classic EMG systems have long cables connecting the sensing contacts to the instrument. These cables can act as antennas, picking up electrical noise along their length and, because of the very low voltage of the EMG signal, can be susceptible to artifact from cable sway when subjects move during dynamic activity. Some EMG systems offer preamplified sensors, often called active electrodes, which place noise rejection circuitry and an amplification stage at or near the skin site (see Fig. 5.2). These sensor assemblies tend to be larger than nonamplified sensors but offer advantages in noise and artifact rejection, particularly when assessments are conducted that involve movement. A mixed design places the preamplification stage at the end of a cable that can be located near or on the patient; relatively short lead wires (typically 3–18 inches in length) then run from the preamplifier to the sensor contact points on the patient (see Fig. 5.2c).

Types of Electrodes

Most current sEMG sensor systems are designed to use disposable electrodes that combine a

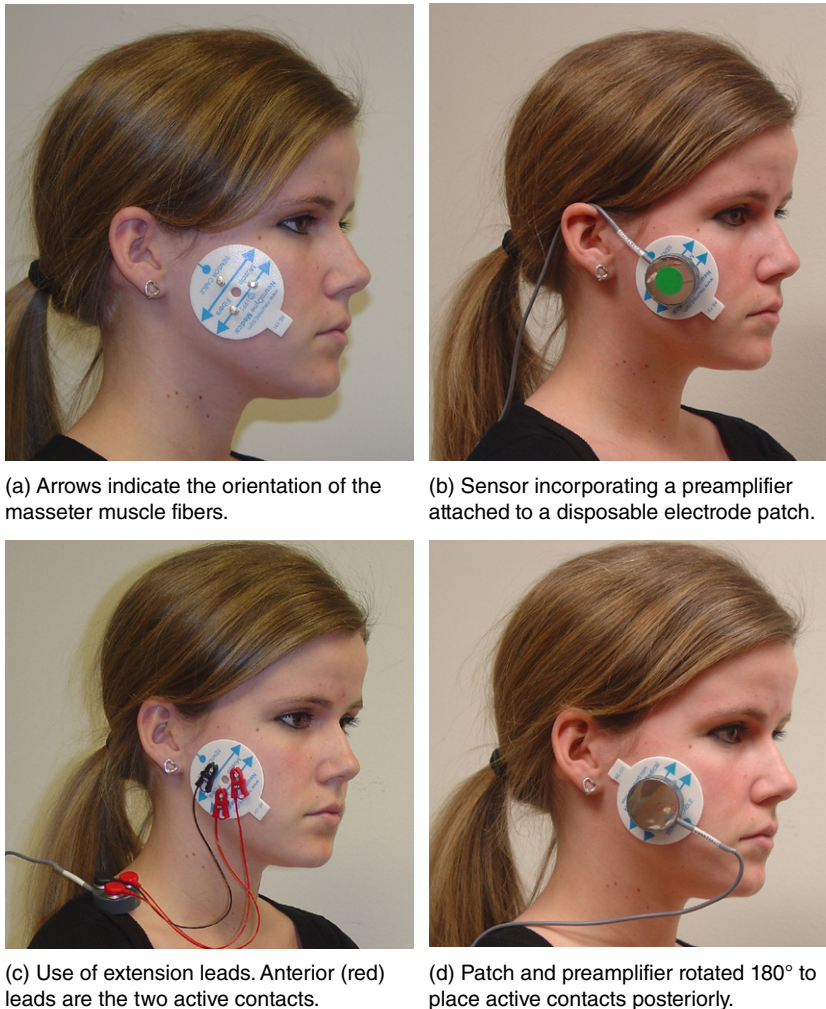


Fig. 5.2. An electrode patch incorporating three flat electrode contacts (two active contacts and a reference) in a single disposable electrode configuration is shown. Patches are also available in a strip configuration with three contacts aligned in a row. Strip-style electrodes can be left whole, with the middle contact point used as the reference (see SCM placement in Fig. 5.3) or one of the contact points separated from the strip and placed in an alternate location to serve as the reference. Individual tape backed disposable electrodes and individual cup style reusable electrodes that are attached with adhesive collars are also commonly used.

conductive metal contact surrounded by adhesive foam or tape to affix the sensor to the skin. The metallic contact may be flat (for use with or without a thin film of conductive electrode gel) or may be cup shaped (to be filled with electrode gel). When using cup style electrodes, it is important to make sure the cup is filled completely; air pockets or gaps between the gel and

the skin reduce the effective contact area and degrade signal quality. On the other hand, overfilling the electrode cup can result in the gel being forced under the adhesive when the electrode is pressed onto the skin. This can result in the sensor coming loose from the skin due to loss of adhesion. If the gel spreads across the skin and makes contact between closely spaced

sensors (bridging), this will decrease the quality of the recording. Care in filling cup electrodes evenly will avoid these potential problems. Pre-gelled electrodes are available; however, they tend to be more expensive and have a limited shelf life (as the gel tends to dry out). If the signal quality of pre-gelled electrodes is suspect, applying a thin film of electrode gel to the pre-gelled surface will generally “revive” the electrode. Look for electrode gel that is specifically labeled for EMG or EKG use. EEG gel may be used if it has a “jelly” like consistency; avoid EEG paste that has a thick, chalky consistency. Most ultrasound gels are not electrically conductive and should not be used.

Electrodes that have a dark gray or black surface are most likely silver/silver chloride based and should always be used with electrode gel. The electrical resistance of silver/silver chloride is much higher than pure silver and a recording advantage is only obtained when silver/silver chloride is combined with a chloride based electrode gel to lower the overall impedance of the electrode–skin interface. Flat silver electrodes, identifiable by their overt silver color, are intended for use with high-quality preamplified sensors for purposes of allowing recordings to be made without the necessity of applying electrode gel. While silver electrodes work much better for this purpose than silver/silver chloride electrodes, they also benefit from the application of a thin film of electrode gel. The author strongly recommends the use of gel with both types. For flat electrodes, only a thin film of gel on the electrode surface is required (more is not better due to the adhesive undermining and bridging issues already mentioned). One approach to applying a thin film is to simply squeeze a small amount of gel on the tip of a finger and then evenly spreading it across the electrode surface. Alternatively, gel can be squeezed directly onto the electrode surface and then all but a thin film is removed using the edge of a tongue depressor.

When working with preamplified sensors such as those shown in Figure 5.2 and Figure

5.3 that have built-in female snap receptacles for mating directly to the male snap contacts of disposable electrodes, be very careful that electrode gel does not get into the snap receptacles. Because of the high salt content of electrode gel, it will eventually corrode the metal contacts of the preamplified sensor and can damage internal circuitry. This is not typically covered under manufacturer warranties, and these sensors can be expensive to replace. If gel should get on these contacts, wipe clean with an alcohol prep pad or cleaned with a Q-tip moistened with alcohol. Never immerse preamplified sensors in water or otherwise soak in any solution to clean them as they are generally not watertight and can be damaged by immersion.

Electrode Spacing

Placing the two active recording contacts close together confines the activity recorded largely to a specific muscle or even a region of a large muscle. As illustrated in Figure 5.1 and Figure 5.3c, a somewhat wider spacing is sometimes used with the sternocleidomastoid (SCM) muscle due to its length. Wide placements that span more than one muscle group are discussed in a later section. Close spacing should be maintained if the goal is to discriminate activity arising in different muscle groups. Consistency of spacing between the active contacts and consistency of location of placement over a muscle is very important if absolute EMG values are to be compared over time and for comparison across individuals.

Skin Preparation

Oils, dirt, skin creams, lotions, makeup, and dry skin cells all impact significantly the conductivity of the pathway between the skin and the sensor. Cleaning the skin with isopropyl alcohol is strongly recommended regardless of how “clean” the skin surface may appear. Alcohol prep pads work well for this purpose. After cleaning the skin with alcohol, wipe it dry with

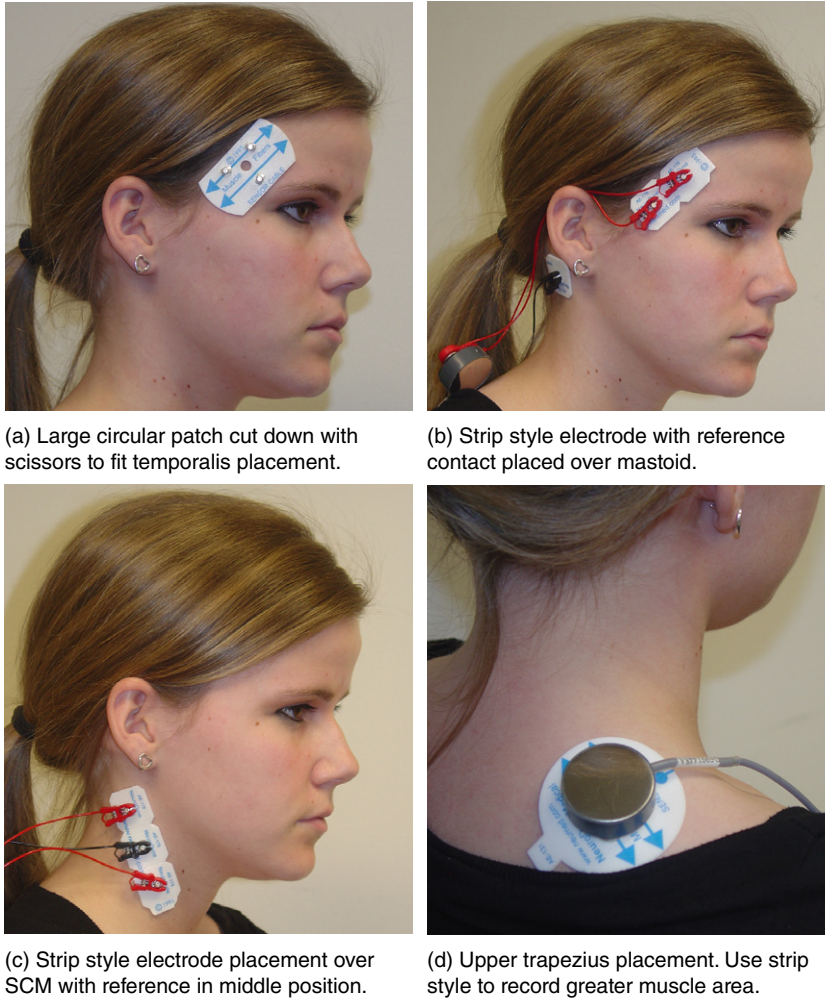


Fig. 5.3. Placements for the temporalis, sternocleidomastoid (SCM), and upper trapezius muscle are shown using both large circular electrode patch incorporating three flat electrode contacts (two active contacts and a reference) in a single disposable and a strip-style electrode that can be used whole or separated into individual contacts. Keeping the active contacts close together restricts a recording largely to a specific grouping of muscle fibers/functional muscle. Spacing them farther apart provides a more generalized recording and will pick up activity from surrounding muscles.

a tissue or gauze pad. Wiping the skin dry in this fashion will support better adhesion of the electrode adhesive to the skin and results in a very mild abrasion of the skin, reducing the electrical resistance by loosening and removing some of the dead surface skin cells. The introduction of

preamplified sensors with “dry” recording capability has greatly increased the ability of high-end instruments to detect EMG activity under poor recording conditions; however, signal quality can invariably be improved by wiping the skin with alcohol and applying

electrode gel to the electrode surface. Hair tends to push the electrode away from the skin surface. Where hair is thick, it may be necessary to shave the site to obtain a reliable recording.

Summary points on sensor attachment:

- Clean the recording site with an alcohol prep pad or gauze pad moistened with alcohol.
- Dry the skin with a tissue or dry gauze pad.
- If using cup style electrodes, fill the cups flush to the top edge with electrode gel. For flat electrodes, apply a thin film of gel on the flat contacts. For pre-gelled electrodes, apply a little extra gel if the electrode appears to have dried out.
- For muscle-specific recordings, orient the two active electrode contacts so that they are oriented along a line that runs parallel to the direction of the muscle fibers. For bilateral recordings, make sure that the electrodes are placed at equivalent locations on both the right and left muscle and the two active contacts on each side are an equal distance apart.
- Run a finger gently over the body/edges of the adhesive pad or tape attaching the electrodes to the skin to confirm that there is good contact.
- When pressing down on electrodes to obtain good contact, make sure that the head is supported so that the patient's neck muscles are not strained when pressing. If the head is not otherwise supported, place a hand behind the patient's head to provide support/counterpressure at this time.
- Check the quality of the recording before starting an assessment or beginning active biofeedback training. This is often done by asking the patient to gently contract the muscle being monitored to confirm that an appropriate response is obtained.
- If in doubt about the quality of a recording and the instrumentation appears to be set up correctly, remove the electrodes in question and start over again with a fresh set, clean the skin again with alcohol, and so on.
- When speaking with patients, it is generally advisable to refer to electrodes as "sensors."

Muscle Sites Frequently Used in Dental Applications

The descriptions of muscle function in this section are drawn from a variety of sources, including Cannistraci and Fritz (1989), Hudzinski and Lawrence (1990), Glaros and Lausten (2003), and Criswell (2011).

The study of the masticatory muscles using sEMG techniques dates to at least 1949 when Moyers' paper on muscle contraction patterns in malocclusions appeared. Muscles associated with primary jaw function that are most frequently monitored using sEMG techniques are the masseter and temporalis muscles (Fig. 5.1). The masseter muscle has its origin at the zygomatic arch and inserts at the angle of the mandible; it elevates the mandible during mastication and is also involved in protrusion (anterior movement of the jaw). The masseter may also play a minor role in retrusion (posterior movement) and lateral shifts of the jaw. The temporalis is a wide fan-shaped muscle which has its origin on the temporal bone and insertion on the coronoid process and anterior boarder of the ramus of the mandible. It also elevates the mandible, is involved in retrusion, and can play a minor role in ipsilateral shifts. The lateral and medial pterygoid muscles, which lie largely underneath the masseter muscle, also play major roles (the lateral in opening, medial in closing, and both in protrusion of the jaw); however, their location under the masseter muscle makes accurate sEMG recordings problematic. (See Gevirtz (1990) for a description of an intraoral method of recording EMG from the lateral pterygoid.) The hyoid and digastric muscles, which are situated beneath the jaw, are also involved in opening, closing, and positioning. Due to their relatively smaller size and more challenging placement issues, these muscles are less frequently monitored. (Greater attention is paid to the application of biofeedback monitoring of these muscles in cases of swallowing dysfunction [dysphagia] and some forms of speech dysfunction.)

Two other muscle sites of particular interest are the SCM (Fig. 5.3c) and the upper trapezius (Fig. 5.3d). The SCM is of interest for a number of reasons. It can play an indirect role in the positioning and movement of the jaw. The SCM plays a primary role in rotation of the head to the contralateral side, ipsilateral bending to the side, and forward flexion. Elevated activity suggests a role for biofeedback-assisted relaxation training; imbalance between the left and the right SCMs suggest a role for feedback from these sites in functional muscle reeducation. Tension in the SCM can be a source of referred pain that may be experienced by the patient in the temporal-frontal region (frontal headaches) or the ear (earaches) (Mehta & Forgione, 1994; Simons et al., 1999). The upper trapezius muscles are a common site for individuals to hold stress-related muscle tension, are often irritated as result of injury, or can show significant imbalance due to structural or volitional postural abnormalities, or show elevations or imbalance due to guarding of injured muscles. Marked elevations or imbalances in the SCMs or upper trapezius may need to be addressed before maximal success is obtained in working with the masseter and temporalis muscles.

Kasman et al. (1998) encourage practitioners to judge the utility of recording site selection based on symptom history and physical examination results. They recommend including muscles that underlie the pain distribution, that potentially refer symptoms to the area of complaint (see Mehta & Forgione, 1994; Simons et al., 1999), and that reproduce reported symptoms when stretched, resisted, or palpated. Multichannel computer-based systems that allow simultaneous bilateral assessment of multiple pairs of muscles offer some advantages in conducting detailed assessments.

Multisite versus "Wide" Placements

As discussed earlier, standard sEMG recordings place the active (sensing) contacts in parallel

with the fibers of a single muscle. This orientation ensures that the muscle activity directly under the sensing contacts is effectively recorded and allows for maximal artifact removal through the common noise rejection feature of the differential amplifier. This type of placement is preferred when the goal is accurate assessment of the relative activity of specific muscle groups. In situations where a patient shows a significant bilateral imbalance, such as elevated muscle tension in the right versus left masseter, then bilateral training displaying independent signals from the right and left masseter is often the most appropriate. In other cases, a patient may show a general elevation in muscle activity across a wide range of muscles. In such instances, one approach to training is to use a multisite array of sensors and have the patient focus on lowering the activity of all muscle sites in a balanced fashion. An alternative approach is to use what is often called a "wide" placement.

"Wide" placements typically consist of a single sEMG sensor with the active (sensing) contacts placed over two distinct muscles. The most common of these placements is the "frontal" placement shown in Figure 5.4 that is often used for general purpose relaxation training. It is important to understand that a wide placement violates the principle of placing the active (sensing) contacts along a line parallel with the muscle fibers of a single muscle, thus reducing the effectiveness of the differential amplifier in canceling out electrical interference. However, in recording environments where electrical noise is not a significant issue, this configuration offers the advantage of combining the activity of multiple muscle groups into a single index of gross muscle tension. Picking up activity from multiple muscles from a single recording site is known as "volume conduction." It should be noted that there is not a clear consensus on the use of wide placements at this time. Some clinicians believe them to be very useful for relaxation training, whereas others specifically criticize the lack of specificity of the "frontal" placement, particularly for assessment purposes (Hudzinski & Lawrence, 1988).



(a) Classic “frontal” wide placement for monitoring grouped muscle activity.

(b) Placement array to record from four muscle groups independently.

Fig. 5.4. The image on the left (a) is the classic “frontal” placement used in much of the early work on biofeedback-assisted generalized muscle relaxation training. Activity from the frontalis muscles, corrugator, and temporalis are all easily recorded with this placement, and even elevated masseter activity can be detected. A drawback to this placement is its lack for specificity for understanding the underlying patterns of muscle function/dysfunction. The array of placements on the right (b) can be used to examine the activity of discrete muscle groups at rest and during dynamic activity such as opening the jaw and mastication.

In addition to the standard placements presented in this chapter, a detailed atlas of both specific and generalized (“wide”) electrode placements may be found in Cram and Kasman (1998) and in Criswell (2011).

Selecting Muscles for Training

It is important to consider the training goal and individual characteristics of a particular patient when selecting a muscle site or muscles for biofeedback training. Perhaps the most common image of biofeedback-assisted relaxation training is of a patient sitting in a reclining chair with EMG sensors aligned horizontally across the patient’s forehead (which will pick up undifferentiated activity from frontalis, corrugator, temporalis, and contributions from the masseter muscles if they are sufficiently activated). This generalized frontal placement does not allow for any specificity of muscle training but is often useful when the patient carries elevated

tension levels broadly through their facial musculature and the training goal aims at general relaxation. However, it is important to recognize that while some patients may present with generalized patterns of muscle tension, muscular problems can be quite site specific in others (Mehta & Forgione, 1994). For a patient who presents with elevated resting activity in the right masseter and modest or low levels of activity in the left, training to bring the two muscles more into balance may be more clinically significant than lowering overall levels of muscle activity. As mentioned earlier, clinicians should also be aware of the phenomena of referred muscle pain (Simons et al., 1999). Unremarkable temporalis or frontalis EMG levels may be recorded in a patient complaining of pain in the temporal-frontal region, while additional investigation may reveal hyperactivity in the SCM or upper trapezius muscles, which can refer pain to these areas. Multisite assessment of a particular patient’s pattern of muscle activity at rest and during functional activation

of the musculature of mastication is strongly recommended.

Quantifying EMG Activity

When reading about or discussing EMG values with colleagues, it is important to be aware that various methods may be used for quantifying the EMG signal. The details of the different approaches are not as important as recognizing that a given level of muscle activity will be assigned a different numerical value depending on whether peak-to-peak, peak, root mean square (RMS), or integrated average methodology is used. A sign wave varying in amplitude by ± 1 V is quantified as 2.0 V peak-to-peak, 1.0 V peak, 0.707 V RMS, and 0.637 integrated average. To put this in more familiar terms, the electrical power from a standard wall outlet would be rated as 310, 155, 110, or 99 V, respectively. A research study of averaged resting values for the masseter muscle using peak-to-peak quantification would be likely to report values more than twice as large as the values that would be expected using RMS quantification.

It is also important to take into account the frequency characteristics of a particular model of sEMG instrument when comparing data from different settings. Instruments employing wideband filters (see later discussion on frequency) will detect more of the underlying EMG signal than instruments using a more restrictive frequency range. For a more in-depth consideration of the EMG signal, the classic work in the field is Basmajian and DeLuca (1985); a more recent reference (Criswell, 2011) updates a very accessible text originally developed by Jeffrey Cram and Glenn Kasman.

Considerations in Selecting Instrumentation

sEMG instruments intended for biofeedback applications have historically been available in both stand-alone and computer-based configurations,

although computer-based systems have largely supplanted stand-alone instruments in recent years. A typical stand-alone instrument is battery powered and easily portable. Early designs often quantified sEMG activity by means of a scaled meter with a moving needle to represent instantaneous readings. Later units are more likely to use a series of LEDs that light up sequentially (a lightbar) to represent changing levels of activity. A digital display may also be included to provide more precise quantification. High-end units may provide options to display peak values or averaged values on the digital display. The term channel is generally used to describe the number of sites that can be monitored at the same time. Most stand-alone sEMG units are single-channel designs, although dual channel units exist and are particularly relevant for dental applications. In the hands of a competent therapist, a stand-alone sEMG device with simple auditory or visual feedback capacity can be very useful for carrying out basic biofeedback-assisted relaxation training. Dual channel capability is a distinct plus for evaluating and training patients with muscle imbalance problems. Alternately, two single-channel units can largely fill the same role as a dual-channel instrument.

Multichannel computer-based systems that can automatically record and display patterned muscle activity over time provide a valuable tool in assessing muscular-skeletal-dentition dynamics as a function of posture, bite, and in response to bite guards, splints, and other dental appliances. The capacity to measure more than one pair of muscles at a time enhances the practitioner's ability to develop a full picture of potentially complex muscle interactions. In these situations, computer-based systems providing 2, 4, or even 8 channels of sEMG can be considered.

Computer-based systems generally consist of an instrumentation unit that is connected to a standard PC-style computer using a dedicated interface card, serial port, or USB connection. Computer requirements (operating system, processor speed, memory, etc.) vary greatly and

should be checked with the manufacturer before acquiring a system. Most systems are designed to allow the computer to run other applications when not being used for sEMG monitoring. Software for the instrument may be designed specifically for biofeedback, may support both assessment and biofeedback training protocols, or may be intended primarily for research. The ease of use of software packages varies significantly and should be evaluated when selecting an instrument.

Laptops and Electrical Interference

Computers must be properly grounded or their connection to the electrical system and/or their power supplies can be significant sources of electrical interference that can overwhelm the noise rejection capabilities of the sEMG unit. This is not generally an issue for desktop computers since grounded power supplies are standard. If acquiring a laptop computer for sEMG use, select a model with a grounded transformer (generally identifiable by a power supply with a 3-prong power cord). If this is not an option, it may be necessary to run the laptop on battery power. If running on battery power to reduce interference, make sure that the power cord is disconnected from the wall, not just at the back of the computer, as the built-in transformer that is part of the power cord assembly will continue to radiate significant electrical interference.

Frequency Range

As mentioned previously, the electrical potential measured by sEMG represents the grouped activity of many muscle fibers firing in varying sequence and at different rates. At the surface of the skin, this activity spans a frequency range from several cycles per second through approximately 500Hz, with the dominant energy falling in the range of about 50–150Hz (Basmajian & De Luca, 1985; de Luca, 1994). Activity above 500Hz is most likely external electrical artifact, and appropriately designed sEMG

instruments use hardware circuits and/or sophisticated mathematical transformations in software processing to reduce these higher frequency signals. The lower range of the sEMG signal can be contaminated with external noise from wall power and from biological sources such as EKG and EEG activity. Early biofeedback instrument designs frequently limited (filtered out) signals below 100Hz to minimize these sources of artifact. Subsequent research has demonstrated that the spectral characteristics of the sEMG signal shift dramatically into the lower frequency range as muscles become fatigued (Basmajian & De Luca, 1985; Criswell, 2011). This may result in a situation where significant muscle activity (tension) is present but is ignored by the filter design of some instruments.

Removing higher frequency signals is known as low-pass filtering; removing signals at the lower end of the frequency spectrum is known as high-pass filtering. The resulting range of signals that are “passed” by the combined filters is known as the bandpass. All things being equal, it is suggested that the ideal low-end settings for an sEMG biofeedback system should be in the range of 10–35Hz and the upper boundary in the 300–500Hz range. One such example would be a bandpass of 25–450Hz. The addition of a notch filter set to specifically to suppress wall power interference at 60Hz (50Hz in some countries) is often a useful feature in units intended primarily for use in a dental office surrounded by a variety of motorized devices.

Summary points on instrument selection:

- Given that early clinical work and much of the published efficacy research on the application of sEMG biofeedback in treating TMD and MPD was carried out with single-channel instrumentation, single-channel stand-alone instruments can be considered at least acceptable for basic relaxation training. Nonetheless, a minimum of two-channel capacity is strongly recommended for new instrument acquisition so that bilateral training of bal-

anced muscle relaxation across left and right side muscle groups can be carried out.

- Serious functional muscle assessment and reeducation of muscle activation patterns requires a minimum of two-channel capacity. Expanding to 4, 6, or 8 channels has distinct advantages for more detailed assessment and retraining of dysfunctional muscle activation patterns, but the additional sophistication is definitely not a requirement for practitioners who simply wish to provide good, basic biofeedback-assisted relaxation training.
- Preamplified sensors are not an absolute requirement but can offer distinct advantages in electrical noise and various other forms of artifact reduction. Hybrid configurations that place a preamplification stage close to the recording site can offer reasonably good noise reduction capability while not imposing the bulk of a preamplified sensor assembly at the muscle site.
- If acquiring a laptop computer for an sEMG system, look for one with a grounded (3-prong) transformer to reduce the likelihood of power-line and other forms of electrical noise interference.
- Select an instrument that supports wide bandpass recording to ensure that fatigued muscle activity can be detected. It is suggested that the lower value in the bandpass specification be approximately in the 10–35Hz range; the upper limit value is less critical. (See section on Frequency Range for more detail.)

sEMG in Assessment

It may seem at first counterintuitive to discuss the use of sEMG in assessment at the end of this chapter. However, the status of sEMG as an assessment modality is still somewhat controversial in the dental literature. While there is little question concerning the appropriateness of using of sEMG to assess which muscles might best be selected as targets for biofeedback-

assisted relaxation training or muscle reeducation, there is not as of yet a consensus concerning the acceptability of sEMG as a formal diagnostic modality for identifying cases of TMD or MPD. The distinction between these two types of assessment is subtle but worth keeping in mind when reading the literature. As already discussed, variations in electrode placement, spacing, and size affect sEMG recording values, and Castroflorio, Bracco, and Farina (2008) appropriately argue that these factors may account for some of the inconsistencies across research studies on the use of sEMG as an assessment modality. Other factors discussed in this chapter, such as frequency characteristics of the instrument used (i.e., a narrow bandpass that cuts off signals below 100Hz can miss significant activity in fatigued muscles) and skin preparation, are also important considerations.

Some approaches to categorizing conceptually the ways in which sEMG may be employed in assessing dental patients are as follows:

- Evaluate the functional characteristics of muscle activity at rest and activation patterns during masticatory activity that may contribute to TMD/MPD symptoms—as noted earlier, this type of assessment is well recognized as appropriate for guiding biofeedback training when working with TMD/MPD patients but has been questioned for purposes of diagnosing TMD (e.g., Sulinen & Kemppainen, 2007; Manfredini et al., 2012).
- Evaluate the psychophysiological aspects of the stress response and emotional reactivity that may impact TMD/MPD symptoms—this is generally done by presenting an individual with various cognitive tasks to engender performance stress and/or by discussing or having the patient imagine various issues that may be of psychological significance for them (see Cram & Kasman, 1998, chapter 7 or Hudzinski & Lawrence, 1990; Criswell, 2011). Flor et al. (1992) compared 20 chronic back pain patients, 20 TMD patients, and 20 healthy controls and found that the groups did not differ significantly in resting

sEMG values but did show significantly higher sEMG reactivity scores in symptom-relevant sites during stressful imagery (masseter for TMD patients).

- Evaluate whether there are significant psychophysiological components coincident with dental anxiety/phobic symptoms (following procedures similar to those discussed earlier) to determine if muscle tensing is present in association with thinking about or confronting a dental procedure. If elevated base muscle tension is present in the patient and/or sEMG levels are found to increase markedly in response to the stimuli in question, then sEMG-based relaxation training is likely to be an appropriate part of the intervention for this patient.
- Evaluate the reaction of the muscular system to dental appliance/bite guards to assist in the selection/fitting of such devices (Jankelson, 1969; Kasman et al., 1998; Mahony, 2010).

Kasman et al. (1998) present a complementary approach to thinking about the uses of sEMG in assessment. They suggest that a comprehensive evaluation of muscle involvement in TMD and MDP patients will assess (a) whether elevated muscle tension is present in the mandibular elevators in cases of habitual clenching and grinding, (b) the presence of dysfunctional muscle activity patterns during mandibular and cervical movements, (c) effects of postural dysfunction on mandibular muscle activity, (d) the effects of orthotic appliances on muscle activity, and (e) the relative contribution of psychophysiological factors in the precipitation of excessive muscle contraction. A number of sEMG tracings relevant to such assessment procedures are provided in this text as well as in the companion work, Cram and Kasman (1998), and in an updated edition (Criswell, 2011).

The significance of postural dysfunction is explored in Mehta and Forgione (1994), who credit Herbert Gelb as a pioneer in highlighting the importance of posture in understanding craniomandibular syndrome. They also note that

as early as 1965, Strachan and Robinson demonstrated hip rotation associated with one leg being longer than the other was associated with abnormal EMG patterns during mastication. A normal pattern was reportedly restored in this case when a lift was inserted in the patient's shoe. Mehta and Forgione present a series of sEMG tracings, including normalization of a bite pattern following insertion of an occlusal splint. Another case is presented in which a closely balanced sEMG bite pattern is obtained with the patient seated in an exam chair that is later replaced by an unbalanced sustained bite when the patient was assessed in a standing position. They assert that dramatic shifts in observed muscle patterns between the sitting and standing positions can be valuable diagnostic aids in identifying cases where leg length disparity is impacting normal functioning of the masticatory muscles. Lifts can be assessed for their impact on resting and/or functional bite patterns in these cases to determine if a more normal function results. The role for considering a standing assessment when standard sitting examinations are unremarkable was also emphasized by Cram in his work on sEMG scanning (Cram & Steger, 1983; Criswell, 2011). Manfredini et al. (2012) have questioned the use of what they term posturographic techniques for diagnostic purposes as the literature has not consistently shown an association between body posture and dental occlusion. They note that this is most likely due to the many compensation mechanisms that can occur within the neuromuscular system regulating imbalance. This does not, however, logically rule out the potential value of investigating postural factors when imbalanced sEMG patterns are found to be postural dependent.

Just as structurally based postural imbalance can impact muscle activity patterns, excessive muscle tension or imbalanced activation in muscles distal to the muscles of mastication due to volitional postural abnormalities (poor or habit-based posture, muscle guarding), muscular irritation, or injury can impact the normal function of these muscle groups. Consequently,

assessment of muscles such as the SCM, cervical paraspinal, lateral cervical, and trapezius muscle groups may be considered in a comprehensive assessment (Kasman et al., 1998). Expanding on the early two-channel recordings reported in Mehta and Forgione (1994), the Craniofacial Pain Center at Tufts University Dental School in Boston has for many years carried out simultaneous bilateral recordings from the temporalis, masseter, SCM, and upper trapezius muscle sites (see Fig. 5.1) in a standardized protocol assessing sEMG activity that may include the following conditions:

Relax: The first resting reading is taken with the examinee sitting and before the examinee is asked to open, close, or otherwise manipulate the mandible in any way.

Feather Touch: The examinee is asked to start from an open position and very slowly close their mouth. The key reading is the level of activation of the muscles at the point where the teeth just make contact.

Full Bite: The examinee is asked to put their teeth together to the best of their ability and slowly apply pressure until a full bit is obtained.

Criterion Bite: The examinee is asked to put their teeth together to the best of their ability and slowly apply pressure. The examiner observes sEMG readings from the masseter muscles and coaches the examinee to hold an activation level of approximately 30 μ V (RMS quantification, 25–425 Hz bandpass).

Swallow: The examinee is asked to gather saliva in their mouth and told to hold it until told to swallow. The key reading is to measure the high point of the swallow to assess possible tongue thrusting.

The protocol often involves repeating the sequence twice, once with the examinee sitting and then again in the standing position to assess possible postural influences.

Ferrario et al. (2000) proposed an assessment protocol consisting of a 3-second maximum voluntary clench on cotton rolls positioned on the

posterior teeth, a 3-second maximal voluntary clench in the intercuspal position, and a 3-second voluntary contraction and relaxation sequence with a 1-second repetition frequency. Reliability values for this assessment protocol in normal subjects have been reported to have good reproducibility (de Felício et al., 2009). Elements of the protocol were used to compare 42 women with TMD and 18 healthy controls (de Felício et al., 2012). TMD patients were reported to show more asymmetry in the right and left muscle pairs, more unbalanced contractile activity of the contralateral masseter and temporalis muscles, and higher TMD severity scores. This research group has also presented data from a balanced sample of males and females that showed during clenching larger asymmetry in the temporalis muscles, larger temporalis activity relative to the masseter, and reduced mean power frequencies (suggesting muscle fatigue) in TMD patients relative to controls (Tartaglia et al., 2011). Additional assessment protocols can be found in Glaros and Lausten (2003), Hudzinski and Lawrence (1990), in chapter 9 of Kasman et al. (1998), and in Sella (2001).

As noted earlier, while the most straightforward application of sEMG-based biofeedback training is to focus on the relaxation of overly tense muscles as in Budyanski and Stoyva's initial studies, the question of which muscles to train and for what reason should be carefully considered if maximal success is to be obtained. In both relaxation training and in functional muscle reeducation, Kasman et al. (1998) recommend a review of what the actual feedback training objectives are in developing a treatment plan. Possible training objectives can extend significantly beyond basic relaxation. The aforementioned authors outline an extensive list of possible goals, including (a) decoupling of psychological stressors and muscle tension responses, (b) resolving habitual clenching, grinding, or other parafunctional behaviors, (c) restoring optimal mechanical relationships between cervical and masticatory muscles and temporomandibular function, (d) improving

posture, (e) regaining and generalizing improved motor control in functional contexts, and (f) resolving or reducing function limitations and disability. Careful consideration of treatment goals should help inform the development of a treatment plan.

Other Forms of Biofeedback Training

While this chapter focuses on muscle-related assessment and biofeedback, it is important to note that some patients who present with anxiety or stress-related symptoms will be found to have unremarkable muscle tension levels at rest or in response to emotional challenge. Heightened arousal in these individuals may be more pronounced in the sympathetic rather than the somatic nervous system. In dental practice, this situation is more likely to be seen in cases of dental anxiety where it is desirable to help the patient learn to relax during dental procedures than in cases presenting with TMD. (See other chapters in this book for a more detailed consideration of this topic.) Such patients may benefit from other forms of biofeedback such as cardiovascular (thermal) or electrodermal training. Peripheral blood flow is regulated by the sympathetic nervous system, and thermal biofeedback to increase finger or toe temperature (vasodilation training) is aimed at decreasing sympathetic arousal. Another modality, photoelectric plethysmography (PPG), provides a more real-time measure of changes in peripheral blood flow than temperature but is less frequently seen in the dental office as this measure is only available in more expensive, multimodality computer-based biofeedback systems. Electrodermal activity, measurement of changes in the electrical conductivity/resistivity of the skin, may be referred to by a variety of terms, including galvanic skin response (GSR), skin conductance, and skin resistance. Conductive sensors are typically placed on the undersides of the fingers, although the palms or the soles of the feet may

also be used as active recording sites. Electrodermal activity recordings monitor changes in sweat gland activity which is mediated by the sympathetic nervous system. Elevated electrodermal activity (skin conductance level) is highly correlated with the emotional state of anxiety, and momentary fluctuations (skin conductance responses) frequently signal the presence of negative cognitions, catastrophic self-talk, or intrusive imagery. Training to lower skin conductance level can be used as an arousal reduction technique, and skin conductance response monitoring may be useful in systematic desensitization procedures both for objectifying the relative placement of stimuli when constructing hierarchies and to confirm whether an individual is actually experiencing physiological arousal when attempting to imagine an item in the hierarchy. As noted earlier, Basmajian (1989), Lehrer et al. (2007), and Schwartz and Andrasik (2003) are standard references that provide additional detail on biofeedback-assisted relaxation training and stress management principles and technique.

Instruction in slow-paced diaphragmatic breathing in place of rapid and/or shallow chest or shoulder breathing is often a useful relaxation training technique. Multimodality computer-based biofeedback systems are available that include sensors that may be placed over the abdomen to provide visual feedback of the pattern and quality of breathing. Common implementations include flexible belts that monitor stretch/expansion with inhalation or inflexible belts that detect changes in pressure as the patient breathes in and out. A useful strategy in patients who tend to overuse accessory muscles, such as the upper trapezius (shoulder) muscles or the scalene muscles, and underutilize the diaphragm is to place an sEMG sensor over the accessory muscle and a respiration sensor over the abdominal region. Initial tracings for both the accessory muscle and the abdominal placement appear as “hills” on the computer display that move up and down with inhalation and exhalation. The patient is instructed to initially focus on increasing the

relative height of the diaphragm hills and on smoothing out (lowering) the hills produced by the accessory muscles. Attention can then be directed to slowing the pace of their breathing.

Summary

Advances in technology have allowed miniaturization of very sensitive recording devices that make real-time monitoring of the muscles of cranio-cervical-mandibular system a relatively straightforward office procedure. The biobehavioral treatment of TMD/MPD, including sEMG biofeedback training, is a conservative approach that is less expensive than more traditional treatment and is a reversible procedure. There are, at this time, an adequate number of studies to suggest the value of including biofeedback in dental practice.

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Hypnosis in Dentistry



Bruce Peltier

Key points

- The dental appointment is an ideal situation for hypnosis.
- Myths and misunderstandings prevent dentists, hygienists, and assistants from using hypnotic methods.
- There are several useful forms of hypnosis which include trance and nontrance experiences, hypnotic language, distraction, metaphor, and indirect suggestion.
- Many hypnotic techniques are easy to learn and use in everyday dental practice. Dental practitioners owe it to their patients to utilize them.

If M. Mesmer had no other secret than how to put the imagination into motion effectively, for health purposes, would not that still be a marvelous blessing? If the medicine of imagination is best, should we not practice the medicine of imagination?

—From the original scientific investigation of animal magnetism commissioned by King Louis XVI of France (Franklin et al., 1784)

Hypnosis has been available to dentistry for centuries, yet it is underutilized and widely misunderstood. This chapter describes the essential nature of hypnosis and recommends applications that should be learned and used by every competent modern dental practitioner. The subject is too vast and complex to be covered in a short chapter such as this; consequently, the goal of this chapter is to introduce hypnosis, dispel inhibiting myths, and provide

a map along with encouragement for exploration. Recommended readings are provided at the end of this chapter.

A proper understanding of hypnosis can enhance the experience of both provider and patient, and dental personnel who fail to apply basic hypnotic principles are letting their patients down.

A Brief History of Clinical Hypnosis

Hypnosis has a storied past, filled with mystery and misunderstanding. Hypnotic practice has suffered by being caught between implausibly exaggerated claims and overwrought skepticism. The literature on hypnosis is littered with reports such as Ewin's (1992) study titled "Hypnotherapy for Warts (*Verruca Vulgaris*): 41 Consecutive Cases with 33 Cures" and Willard's (1977) purportedly successful research on "Breast Enlargement through Visual Imagery and Hypnosis." Nonetheless, it has survived over the centuries while many other nonphysical forms of healing have not. The American Medical Association officially endorsed hypnosis as a treatment modality in 1958, recommending its inclusion in mainstream medical training (Wester, 1987).

While trance was exploited by ancient healers, the modern history of clinical hypnosis begins with the Viennese physician, Anton Mesmer. Mesmer studied gypsy and religious healing practices and became intrigued with the "laying on of hands" which seemed to produce medical results. His work in "animal magnetism" was eventually discredited when a distinguished panel of investigators, including Benjamin Franklin, Antoine Lavoisier, and Dr. Joseph Guillotin, acknowledged that Mesmer had achieved positive physical outcomes. They found, however, that his "cures" (including "crises" and convulsions) were not the result of animal magnetism or the influence of heavenly bodies, as Mesmer had claimed, but "that this new agent may be only the imagination itself,

the power of which is so great that it is little understood." (Franklin et al., 1784).

The "father" of clinical hypnosis was a Scottish physician named James Braid (Kroger, 1977). He replaced the concept of animal magnetism with his term "hypnosis," derived from the Greek word for sleep, *hypnos*. This turned out to be an unfortunate naming, as comparisons of hypnosis to sleep are inaccurate and misleading. Interest in medical applications of hypnosis was great in nineteenth-century Europe, where Bernheim, Charcot, Janet, and Freud all conducted extensive explorations into its usefulness. Unfortunately, Freud discarded hypnosis, partly because it bypassed the very resistance and defenses that his approach was designed to explore. Hypnosis did not fit his theoretical view, and Freud's powerful influence dampened collegial interest. Janet was prophetic at the time, however, when he said, "If my work is not accepted today, it will be tomorrow when there will be a new turn in fashion's wheel which will bring back hypnotism as surely as our grandmother's styles" (Kroger, 1977, p. 4).

The physical and psychological trauma of two world wars accelerated interest in hypnosis, and military doctors returned home from battlefields motivated to continue their study of trance and healing.

The next wave of interest in hypnosis was generated in the second half of the twentieth century by the charismatic and somewhat eccentric psychiatrist, Milton Erickson. His innovations and publications excited a generation of physicians, psychologists, and dentists, and his views shaped the way that modern clinical hypnosis is understood. Erickson understood hypnosis more broadly than his predecessors, and he eventually focused on the ways that humans influence each other subconsciously, both in and out of formal trance states. Zeig (1987) observed, "To Erickson, hypnosis was not merely a trance state within a person; it was a special context for communication . . ." (p. 394). Erickson actually caused a paradigm shift in the ways that hypnosis is understood

and practiced, and those changes are described later in this chapter.

The Nature of Hypnosis

Hypnotic interventions can add to clinical practice in the following ways (Holroyd, 1987):

- enhanced rapport
- increased suggestibility
- positive use of attention and awareness
- utilization of dissociation
- access to the mind–body relationship
- use of imagery
- responsiveness to the doctor’s messages.

Since patients and doctors typically fail to avail themselves of the benefits of hypnosis due to misconceptions, it is wise to begin with those. A multitude of myths and misunderstandings blur our ability to take advantage of something that is inexpensive (or free), generally harmless, relatively easy to do, and filled with potential benefit. Here are four important problematic myths.

Myth #1: Hypnosis Is a Trance State

This is the most pervasive misconception. While hypnosis has historical roots in formal trance induction, trance is only one aspect of the hypnotic continuum. This myth is problematic for dentistry because deep trances can be time-consuming, because relatively small numbers of people are capable of the kind of trance states that yield reliable dental anesthesia or analgesia, because most people are frightened by the prospect of entering a deep trance at the suggestion of a hypnotist, and because stage hypnotists have made fools of volunteers in public. Most of the value of dental hypnosis lies in qualities of hypnosis that do *not* involve deep trance states or lengthy inductions.

Similarly, people think that hypnosis must involve relaxation, and dental patients are not typically relaxed in the chair. But hypnosis, in all of its forms, does not require physical relax-

ation. People who are extremely tense or even terrified sometimes slide into a defensive trance state in emergencies. Their brain locks up, and they cannot think of anything, especially not the present-moment consequences. One of the most prominent teachers in the history of clinical hypnosis, Kay Thompson, was a dentist. She wrote that, “I have increasingly turned away from the relaxation-sleep model . . .” and that hypnosis will work for a patient “whether or not he looks as though he is relaxed.” (Kane & Olness, 2004, p. 139).

Myth #2: Hypnosis Involves Loss of Control

Most people do not cherish the idea of losing control, especially in a dental office. Much of the difficulty that patients have with visits to the dentist involve a real or perceived loss of control, and the thought of giving over more control to a dentist is not attractive to most patients. However, properly conducted hypnotic interventions actually help people gain control and manage themselves more autonomously and effectively.

Myth #3: Hypnosis Is Dangerous

People (doctors and patients) are concerned that odd or bizarre things might happen when a dentist hypnotizes a patient, especially if the dentist is inexperienced in hypnosis. The procedures and skills described in this chapter have little or no chance of harming patients, especially if the dentist does not attempt to coerce patients. The only formal prohibition involves patients who are Christian Scientists or Seventh Day Adventists, as these faiths do not condone the use of hypnosis (Kane & Olness, 2004).

Myth #4: The Doctor Must Possess an Elaborate Set of Skills and Must Exercise Them Charismatically

Some hypnotic skills are complex, and the learning curve for a hypnotic practitioner can be long (and interesting—even thrilling), but

the basic skills required to hypnotically enhance a dental practice can be taught to doctors, hygienists, assistants, and front-office staff in a relatively short period of time. They do require diligence and focus, but they're worth it, both in terms of patient experience and practitioner satisfaction. Humans possess a natural capacity for trance (Kane & Olness, 2004).

Defining Hypnosis and Using It

Novices think exclusively about trance when they think of hypnosis, but there are other ways to define hypnosis that open the door to widespread and efficient application in dental care. There exists no single, well-accepted definition of hypnosis. Carol Erickson reported (personal communication) that her father, Milton, once said, "I've been doing hypnosis for fifty years, thinking about it for fifty years, and I still don't really know what it is." In fact, as Lynn and Rhue (1991) observe in their book on theories of hypnosis, "There is no question that hypnosis has eluded a single, simple definition."

What follows is a description of a "map" of hypnosis. An outline of this map can be found in Table 6.1. This description is quite basic in nature, and the map is not the territory.

Forms

It is useful to divide hypnosis into two forms: *trance* and *nontrance*.

Trance

Trance is a "state" of consciousness that allows special focus. Trance is not exclusive to hypnosis or meditation, and there are countless variations of natural trance states in everyday life. In fact, it is best to think of consciousness as variegated. When people think of hypnosis, they usually have heavy trance states in mind. Deep trances represent an unfortunate stereotype of hypnosis. Heavy trance states can be interesting

Table 6.1 Clinical Hypnosis Map

Forms

Trance

- Light
- Heavy

Nontrance

- Language
- Indirect suggestion
- Stories
- Modeling

Styles

- Authoritarian-direct
- Permissive-indirect

Uses

- Suggestion
- Uncovering
- Developing imagery resources
- Relaxation

to be sure, and they can even be useful in the hands of a skilled hypnotherapist or dentist. But a relatively small number of people are capable of easily or conveniently entering deep trance states. The majority is not (American Society of Clinical Hypnosis, 1973, p. 6; Moss, 1977, p. 323). Most people can learn to enter a moderately deep state, given time, practice, and concentration, but this can prove inefficient or impractical in a real-life dental practice. When Milton Erickson used deep trance, he often spent hours preparing his patient for the experience (Hammond, 1990, p. 21), and he spent a lifetime preparing himself.

There are many varieties of consciousness that we all experience every moment of every day. These variations can harm us (the flashback of the person with posttraumatic stress disorder, for example) or help us (when we imagine accomplishing something difficult). We drift in and out of various trance-like states all the time. We stare out a window. We gaze at an attractive person who happens to walk by (and lose our previous train of thought!). We absorb ourselves in a good novel or video game. These are common examples of natural trances.

It is useful to (somewhat artificially) divide trance into “heavy” states and “light” trance states. It is the variety of trance that interests the modern clinical hypnotist, along with the way that focus-of-attention works in trance. For example, most people have experienced the inconvenience of a cracked car windshield. It’s an annoyance at first, but we rather quickly learn to stare right through the crack to focus on the highway. It isn’t long before we don’t even notice the crack at all. Many people talk on cell phones while they drive cars, and they persist in spite of laws prohibiting that behavior. Pedestrians stroll into urban crosswalks holding a mobile gadget, completely oblivious to the danger of traffic. These are examples of how we focus our attention in variable ways, and this is one key to the use of trance hypnosis in dental practice. Dentists take advantage of focus when they use a physical or verbal distraction technique to give an injection. Patients who have trouble in the dental chair are not managing their focus optimally for the experience. You could not drive a stick-shift automobile if you focused exclusively and obsessively on each step or on the possibility that a shifting error might cause your demise. The nature and content of one’s focus is key, and they are powerful determinants of positive and negative experience. Fear of pain in dentistry is often a greater problem than the actual physical experience of pain, and there is an endless list of scary things available for a dental patient to focus on (Kane & Olness, 2004). It is difficult to work with a patient who focuses exclusively on danger.

Many, if not all, patients enter the dental office already in a trance state. Such a “state” can impair practice or enhance it, depending upon the ability of the dental team to recognize and utilize it. “Focused attention can lead to comfort as well as discomfort” (Zeig, 1987, p. 396). Dental patients are typically motivated to alter their focus, if only to escape potential pain, to escape the operatory, and to avoid being controlled by the doctor and office staff. A dentist can take advantage of naturally occurring states through “utilization,” recruiting something in the natural

environment to enhance trance. For example, one can say, “Let the sound of my instruments help you go deeper inside to a comfortable place” or “Whenever you hear my hand piece, let that be a signal for you to go back to that special place in your mind.”

Nontrance Hypnosis

Nontrance hypnosis can be defined as *a way of communicating and influencing which bypasses critical-analytical thought*. This definition opens the door to the numerous ways that we influence each other on a moment-to-moment basis. We are not even aware that most of the influencing happens. When you motion to someone with your hand, they walk through a doorway ahead of you. When you lower your voice, you send a message that something is important or private. When you raise your eyebrows, you might send a message that something is strange or unexpected. These ways of influencing are powerful partly because they are unexamined. They tend to bypass the limitations of one’s critical thinking or belief system. We are always sending messages and influencing each other, and the nonverbal messages are usually more powerful than the verbal ones. You can tell a patient that there is nothing to fear, but the sound of the high speed drill can send a more compelling and ominous message. Similarly, you can welcome a patient to your operatory and tell them how glad you are to see them, but the speed of your speech and your rushed physical movements send a different message. The nonverbal message bypasses reason and powerfully influences the brain and mind. Verbal messages are overwhelmed and lost.

Language

Language can be hypnotic in a similar way, when the use of words and sentence structure influence by bypassing critical-analytical thought processes. The essential factor is *implication*. What we imply is often more powerful than what we say. Even if it is not, implication cannot be ignored, for it changes the meaning of the

overarching verbal message. For example, the word *try* is hypnotic. It is often meant to communicate, "please do this," but its deeper, more powerful implication can be, "make some efforts in that direction, but fail to actually accomplish it." There are some words in dentistry that are so toxic that they should be used cautiously, if at all. Examples include, *pain, shot, hurt, needle, drill, cowhorn, mercury, patient refused, chief complaint, waiting room, poor historian*, and many others which serve only to alarm or demean people or call to mind threatening images or feelings. They communicate danger to many people. Pediatric dentists tend to be quite aware of the power of specific words, and dental students are given lists of translations to use with kids. Hurt or pain is called "bother" or "discomfort." The explorer is referred to as the "tooth counter" and the perio probe is called the "ruler." Xylocaine is called "sleepy juice." The word "discomfort" is, itself, an interesting example of hypnotic communication. There is a principle in hypnosis which asserts that one cannot *not* think of something. (Even the grammar-checker on my computer balks at this sentence!) You cannot not think of an elephant. In order to "not" think of an elephant you have to (positively) think of it and then "try" to not think of it (that elephant). It really cannot be done. "Not think of an elephant" is a self-canceling phrase, similar to the sentence "Everything I say is a lie." (That phrase has trance-inducing qualities as well. Try to make logical sense out of it and see what happens.) "Discomfort" contains the word "comfort" inside of it for many people at some irrational, unspoken level. Discomfort (paradoxically) implies comfort.

Indirect Suggestion

Indirect suggestion is another form of hypnotic influence, and it does not involve formal trance states. You can communicate something without explicitly saying it or even saying it at all. In fact, you can even communicate an injunction by asking for its opposite, and sometimes this proves to be a more powerful way. For example, you can add the word "yet" to the end of a

sentence and change its meaning. "You haven't experienced the latest ways that dentists can get people numb yet" implies that they will have that experience. "You haven't figured out how to breath in a way that allows you to be comfortable while we take impressions yet" implies that you will teach yourself how to get through the impression process soon (or at least some time in the future) without gagging. If you look closely at the sentence you can see that it also implies that there will be more impressions taken in the future.

You can also imply that patients will do something in the future by asking them not to do it now: "Please don't get too relaxed just yet. I have to ask you a few medical history questions before we get started." This sentence sends the message, by implication, that you will relax when the "real" dentistry happens.

You can preempt resistance or criticism with a sentence like this: "This might sound a little odd, but many people tell me that they actually enjoy coming here for their dentistry," or "This is going to sound silly, but . . .," or "I know you're not going to believe this, but many people don't even feel it when I give them anesthetic." Such a sentence opens the door for people to say to themselves, "Let me be the judge of that" or "I'll see about that" rather than "I know I can't stand injections" or "I hate the dentist's office."

Casual remarks by an authority figure such as a doctor can have a powerful impact on patients already in a natural trance state. Dentists should routinely make a simple, confident suggestion for health at the end of each appointment, such as "You'll probably feel quite nice when the numbness wears off."

Stories

Stories are hypnotic, and powerful influencers use them. A story has a way of capturing one's imagination and, once again, influencing in a way that bypasses critical-analytic reasoning. People tend not to defend themselves or their point of view from a story (Kane & Olness, 2004). We process information from stories dif-

ferently than we process a direct injunction (in the form of "You should do X."), and we generally offer less resistance. A good story causes a person to focus in a special way on what is being said and to listen for implication, meanings, and "lessons." It's often better to tell a hopeful or cautionary tale rather than to give a directive such as, "Don't do that, because you might get hurt." You have a greater chance of influencing a child by telling a story about another child who is now blind than by warning that child not to point their BB gun at other people. A smart dentist collects stories about patients and dentistry and life so that he or she can use those stories to make points with patients. "I once had a patient . . ." stories are important tools in a hypnotic dentist's kit. These stories can be used to communicate expected behavior (a story about a patient who did not follow specific postoperative instructions can be very powerful!). A story about a phobic patient who had a wonderful experience in your dental practice is quite useful, especially if it includes hints about the specific behaviors (theirs and the dentist's) that created the positive experience. Metaphors work in a similar way, bypassing conscious logical resistance. Dental personnel would do well to stock up on metaphors such as, "You wouldn't want to build a house on a weak foundation" or "If your house were on fire, what would you do first, remodel the kitchen or put out the flames?" The logic of the story is impossible to contest.

Modeling

Modeling is a fourth form of nontrance hypnotic influence. People respond more powerfully to authentic models than they do to advice from others. All members of the dental practice, including dentists, hygienists, assistants, and front-office staff must model a positive, friendly, safe, comfortable, can-do attitude. These attitudes are contagious, and they send important messages about safety and competence. How could patients feel comfortable if the dental office is dingy or if staff members seem sad or angry or hurried? Imagine how a nervous

patient assesses the situation when the doctor seems disorganized or frustrated or bored? There is nothing that can be said to cancel the powerful physical, visual, sensual, and behavioral messages modeled by the dental team. The physical behavior of the dentist creates an atmosphere of safety or danger, of caring or impersonality, of warmth or coldness. A disorganized dentist sends a terrible message, and a gentle and confident hand on the shoulder or jaw, or a reassuring smile can send an overwhelmingly positive message that bypasses critical-analytic reasoning or resistance. The hypnotic dentist develops a set of gestures that are trance enhancing. The way that a dentist moves and uses his or her hands can promote a feeling of safety, comfort, and confidence.

"Spa dentistry" seems to be on the right hypnotic track with headphones for soothing music, comfortable chairs, warm blankets, "lifescape" glasses that create the sensation of babbling brooks or a day at the ocean, and even the smell of fresh-baked cookies!

Styles

There are two different styles of hypnotic communication, a direct-authoritarian style and an indirect-permissive style. Both can be effective when applied appropriately.

Authoritarian

The traditional way to use hypnosis is *authoritarian*. The "hypnotist" is thought to be in charge of the trance and situation. Forceful suggestions are used to direct a patient into a deep trance state and to cause linear behavior change. "Your eyes are feeling sleepy and your eyelids are feeling heavy," is an example of an authoritarian way of trance induction. A direct induction might include phrases like, "At the count of three your eyes will close and you will go into a deep trance." The most authoritarian approach of all is exemplified by the televised "healer" who smacks a subject on the forehead and

shouts, "Sleep!" Such an approach can be useful in a dental office when used by a well-trained, confident hypnotist and a cooperative patient but, like deep trance states, such an approach is not typically practical or even appropriate.

Permissive

Modern clinical hypnotists favor more *permissive* tactics which take advantage of the opportunities for trance and suggestion that naturally present themselves in dental practice. Most patients enter the dental office with a special kind of focus, and the hypnotic dentist might need only say, "Just go ahead and let yourself relax for a few moments before we get started." The dentist offers choices and follows up on those taken by the patient: "You can go ahead and close your eyes while we examine your teeth or you can keep them open and pay close attention to what we do, it's completely up to you." The dentist observes the patient's choice and reinforces it: "That's right. Stay focused on the handle of the lamp while I begin to work. Continue to breathe comfortably and relax more and more as your mouth remains open and relaxed." Indirect suggestions for comfort and cooperation can then be used: "Many people are pleasantly surprised at how comfortable they can become in a dental chair."

Uses

Hypnotic phenomena can be used to enhance dentistry in several ways. First of all, *relaxation* often (but not necessarily) accompanies light trance or hypnotic rapport, and relaxation is fundamentally incompatible with anxiety. This is the simplest benefit of trance and often, out-of-trance hypnosis, and it is helpful and important to patients and dentists. If this were the only benefit of hypnosis, the endeavor would be worthwhile.

The second benefit is from the enhanced power *suggestions* have as a result of hypnosis. It is widely assumed that suggestions given to

someone in a trance state have a good chance of being accepted uncritically and remembered powerfully or subconsciously. Even if they are not completely accepted, they are likely to be heard very clearly by someone in a moderate or deep trance, and the whole point of nontrance hypnosis is to influence through direct or indirect suggestion. Dentists and their team can make all kinds of useful suggestions; suggestions for relaxation, for a comfortable impression-taking or radiographic session, for comfort during injections, for comfort during appointments, for minimal swelling and bleeding after an extraction, for accurate cooperation with postoperative home treatment, for flossing and brushing, and for clenching and bruxing, to give a few examples. Dentists would do well to experiment with suggestions such as, "If you could dry your mouth out a little bit, it would be easier for me to work. Just turn off some of the salivation." (This is a great distraction, even if salivation does not change.)

A third application of hypnosis, the development of *imagery resources*, is very important to dentistry. Images tend to communicate more powerfully than words. Imagine "the taste of butterscotch" and compare it with a description of its recipe. Light trance states ("close your eyes") can be used to help patients find an internal source of strength, comfort, or self-efficacy that can enable them to survive or thrive in a dental appointment. For example, a dentist or assistant can simply ask the patient to sit back, relax comfortably, notice their breathing, and let their breathing become relaxed. They can then suggest that,

You can close your eyes now or later, or you can keep them open. It really doesn't matter. Most people enjoy having them closed to do this. Go inside of yourself for a few moments and find something that will help you right now. Maybe you will find an image that feels good. Perhaps you have a favorite place where you love to go to feel relaxed and comfortable, and safe. Perhaps you can imagine a person who

has a way of making you feel good in some way. It could even be a visual image or a favorite color or sound. I don't exactly know what you will come up with. Let me know by raising your hand slightly as a signal that you've found something that works for you.

Patients can then keep that imagery resource in mind while the dental appointment proceeds. As an example, I once treated a patient with a significant dental phobia. In my psychology office he took several sessions to establish a solid mental relationship with a purple kaleidoscopic image and later used it to get through an oral surgery appointment that involved the extraction of several broken teeth and root tips. He was genuinely thrilled with his successful passage through a long-avoided procedure. All that the oral surgeon had to do was to allow this patient a few moments to gather his imagery resource and get it locked into focus.

The fourth use of hypnosis may not be directly useful to dentists but is extremely useful to psychologists and could certainly be useful in a coordinated treatment effort between practitioners of those two specialties. It is called *uncovering*. Light to moderate trance states are used to help patients reveal things to themselves that might be related or responsible for problems such as dental fears, phobias, or even bruxism. This is an occasion to note that hypnotic skills do not somehow allow a dentist to practice psychology nor would it help a psychologist to practice dentistry. Hypnosis is extremely unlikely to cause any harm as long as dentists use it to practice dentistry and not psychotherapy. If a dentist suspects that a patient is restricted by a deeper psychological malady, the dentist should coordinate care with a psychologist trained in hypnosis and familiar with dentistry. Effective hypnotic practice might require a dentist to find a hypnotic psychologist to help with the dental practice, so that appropriate and regular exchange of referrals is possible. Many patients will benefit from such a collaborative arrangement. The psychologist

can spend 3 to 10 sessions with patients to get them ready for comfortable and efficient dental care, and can accompany such patients to the dental office for the first few transitional dental appointments.

Recommendations for Dentists

1. There is much more to learn about trance and nontrance hypnosis in all of its natural and clinical forms.

This chapter scratches the surface. There is much more to learn about natural and clinical hypnosis, including trance, hypnotic communication, direct and indirect suggestion, imagery, and physical relaxation. A list of recommended readings is attached at the end of this chapter. Hypnosis cannot be learned from books, of course. Hands-on, supervised training is available, but since interest in hypnosis is presently in a period of quiescence, you may have to assert effort to find good training. You will be able to find a few expert psychologists or dentists in any urban center who would be willing to provide training.

Hypnosis attracts quacks. Be careful about collaborating with practitioners who do not possess a legitimate license to practice psychology or psychotherapy. That said, some of the "quacks" who make themselves available through the Internet or neighborhood newspaper ads are actually quite skilled at trance induction. The problem is that they do not have training in safe, scientifically based clinical care.

The American Society of Clinical Hypnosis provides regular training for beginners, intermediate, and advanced users of hypnosis, along with a journal and list of teachers and practitioners. Information can be found on its web site. The organization welcomes dentist members.

2. Do not fall for or promote the prevailing myths associated with hypnosis. Do not focus on deep trance states and dramatic outcomes.

A healthy use of hypnotic communication can promote a focus on the positive, enhance acceptance, increase emphasis on choice and personal autonomy, decrease resistance to suggestion, and promote an attitude of wonder about possibilities. The shift from an anxious grip on frightening images to an open attitude that wonders about lovely possibilities can be nearly effortless. A lovely experience is just around the corner.

3. Remember that hypnotic capacity varies significantly from person to person and is contextual.

We all have different capacities to use trance and respond to influence and suggestion, and these responses are context dependent. The dental appointment is a special setting that lends itself to trance. Have faith in your patient's capacity to use hypnotic assistance in all of its forms.

4. Teach yourself how to communicate in ways that bypass conscious resistance.

Watch others and learn how these things work. Study your own interactions with staff, patients, and your own children, grandchildren, nephews, and nieces. Be flexible and experimental in your own communications. Teach yourself gestures to communicate with patients. Offer choice in your practice and do not attempt to coerce others.

5. Examine your practice environment to understand the implicit messages that it sends to patients (and perhaps to your team).

Obviously, it is best to create a practice that welcomes people into a safe, calm, and competent place. Observe verbal, nonverbal, visual, auditory, olfactory, and kinesic cues. A high-paced, impersonal, production-oriented practice is unlikely to send optimal, implicit, hypnotic messages to wary patients.

Remember: *Dental work is inside your head* (Betty Erickson in Kane & Olness, 2004, p. 5).

Good luck with your hypnotic adventures.

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Recommended Readings

These readings are presented in order of complexity. Beginners are urged to start at the top of the list and work their way down.

1. Zilbergeld, B., Edelstien, M.G., & Araoz, D (eds.) (1986). *Hypnosis: Questions & Answers*. New York: W. W. Norton. (This book has long been out of print but can be found on used-book dealer web sites. It is very accessible to the novice and is a good source to start with.)
2. Yapko, M. (1995). *Essentials of Hypnosis*. New York: Brunner/Mazel. (This is a good, linear, beginning book for those who want to learn about the basics of applied clinical hypnosis.)
3. Lynn, S., & Rhue, J. (1991). *Theories of Hypnosis: Current Models and Perspectives*. New York: The Guilford Press. (This is a "theories" book that describes various views of hypnosis. It is excellent for the person interested in trying to figure out what hypnosis "is." It reports on several very different descriptions of the basic elements of hypnosis.)
4. Hammond, C. (1990). *Handbook of Hypnotic Suggestions and Metaphors*. New York: W. W. Norton. (This is a large book, filled with specifically worded suggestions and metaphors for an extremely wide range of medical and dental issues, including phobias and fears, TMJ, bruxism, gag reflex, extractions, tongue thrusting, and flossing.)
5. Sheikh, A. (1984). *Imagination and Healing*. Farmingdale, NY: Baywood Publishing. (This book is a comprehensive introduction to the use of imagery in clinical practice.)
6. Rosen, S. (ed.) (1982). *My Voice Will Go with You*. New York: W. W. Norton. (This book is an accessible introduction to a difficult subject matter: the work of Milton Erickson. It includes stories that Erickson used along with examples of reframing, indirect suggestion, and observations by Erickson and others about his work.)
7. O'Hanlon, W. (1987). *Taproots: Underlying Principles of Milton Erickson's Therapy and Hypnosis*. New York: W. W. Norton. (This book attempts to distill and catalogue some of the more complex aspects of Erickson's work.)
8. Watzlawick, P., Weakland, J., & Fisch, R.. (1974). *Change: Principles of Problem Formation and Problem Resolution*. New York: W. W. Norton. (This is the most complex of the books listed and perhaps the most intriguing. It is certainly the most charming. It describes the role of paradox in humane behavior and is a book to read and reread, especially if you think you understand what's going on in the world.)
9. Kane, S., & Olness, K. (2004). *The Art of Therapeutic Communication: The Collected Works of Kay F. Thompson*. Carmarthen, Wales: Crown House Publishing, Ltd. (This book collects many of the lectures and thoughts of the best-known dental practitioner of clinical hypnosis. It includes many practical suggestions directly related to dental practice.)

Anxiety, Fear, and Pain



7

Environmental, Emotional, and Cognitive Determinants of Dental Pain

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Key points

- Acute orofacial pain shares similarities but also has unique aspects, relative to other forms of bodily pain.
- The experience and expression of orofacial pain is determined by a multitude of factors that can be conceptualized across environmental, emotional, and cognitive domains.
- The dental setting is a unique environment with important social and relational aspects that impact pain.
- Emotional factors, particularly dental care-related anxiety and fear, are closely intertwined with orofacial pain.
- Cognitive processing is an important consideration in dental pain, as catastrophizing and memory of pain have been found to relate to the experience and expression of pain.
- Individual patient characteristics, including genetics, age, gender, culture, and other psychosocial factors, affect orofacial pain.

Introduction

Pain is common, even ubiquitous, for all human beings throughout life, and pain associated with the oral cavity is part of that experience; however, oral pain has some unique qualities relative to other types of bodily pain. Oral pain may be different, in part, due to the way in which the teeth are innervated compared to the rest of the body. Additionally, the dental setting is a unique environment which factors into the pain experience. The social and psychological functions of the oral cavity and orofacial region also contribute to special meaning and significance associated with dental pain. While there are differences, however, all pain experiences share some common elements. A person's cognitive interpretations, as well as behavioral and emotional responses to nociceptive sensations, are driven by basic biological predispositions, social and other environmental factors, and psychological considerations, among a myriad of other possible influences.

Among other types of acute dental pain, patients can experience toothache and can seek relief through oral health care. Patients can experience pain prior to procedures; during procedures such as injections, restorations, extractions, root canal treatments, and other services; and postprocedure during recovery (e.g., Pak & White, 2011). While the occurrence of pain during procedures may be low (i.e., affecting less than 25% of general dental practice patients, according to Tickle et al. 2012), public perceptions are that dental care is highly associated with pain. Consequently, dental care-related anxiety and fear are inextricably intertwined with oral pain (see Chapter 12 in this volume).

When considering pain involving the oral cavity, the general context of pain in the orofacial region should be considered. Any pain conditions in the hard and soft tissues of the head, face, neck, and intraoral cavity are considered orofacial pain, as defined by the American Academy of Orofacial Pain (de Leeuw, 2008); however, dental pain as regarded by a layper-

son most commonly is associated with toothache; injury to the teeth, jaw, or face; or procedural pain related to restoration, extraction, endodontic therapy, orthodontics, or periodontal surgery.

Pain is described as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage" (International Association for the Study of Pain Task Force on Taxonomy [IASP], 1994, p. 211). While this definition provides a rudimentary description, it does not fully describe the psychological experience of pain. The IASP asserts that while aversive stimuli do in fact activate the nociceptive response, that itself is "not pain." The perception of pain also is an affective experience, due to its unpleasantness. It is based on an individual's biological predisposition and prior experience (IASP, 1994). The unpleasantness of pain, its cause(s), and future implications contribute to the emotional reaction, which is used as a cue to either escape the situation and/or to avoid it in the future, if possible (MacDonald & Leary, 2005). The painful sensation is the warning signal to the body and may produce a reflexive response. The affect, or emotional response that is associated with pain, varies depending on the stimulus, the environment, and the individual.

From a biological perspective, dental pain often is caused by inflammatory diseases involving the dental pulp or periodontal tissues (Holland, 2001), but it also can be related to other disease processes or injury. Holland suggests that dental pain can be of pulpal origin (e.g., hypersensitivity to dentin, reversible pulpitis, irreversible pulpitis) or periodontal origin (e.g., pericoronitis, periadicular periodontitis, postendodontic pain, cracked tooth syndrome, postextraction pain). This pain, however, can spread to other sites from the teeth (e.g., masticatory muscles), or be referred from/to the teeth from other regions. For example, somatoform disorders, including pain syndromes, can be manifested in toothache, without a clear nociceptive etiology (e.g., "phantom tooth pain"

or *atypical odontalgia*; Holland, 2001). Atypical odontalgia is a chronic form of dental pain without a clear cause (Melis et al., 2003; Baad-Hansen, 2008). There are several theories presented in the literature; however, most evidence supports atypical odontalgia as a neuropathic pain condition (Baad-Hansen, 2008).

This chapter focuses on the social and psychological factors that influence the experience of oral pain, with particular emphasis on the complex interplay among environmental, emotional, and cognitive dynamics, and how they interact with individual differences. First, conceptual issues in understanding dental pain will be presented, followed by environmental determinants of pain. In the third and fourth sections, emotional and cognitive determinants, respectively, will be considered. The chapter will conclude with information specific to individual differences, gender, cultural, and lifespan issues. While the biological aspects of dental pain cannot be overlooked, neither can the contributions of psychological and environmental factors when working to prevent or ameliorate the distress associated with pain-related experiences.

Conceptual Issues in Understanding Dental Pain

Pain terminology is used differently across cultures; however, there are fundamental aspects of pain that are universal. From an evolutionary perspective, pain is a warning signal with adaptive and motivational functions (McNeill & Dubner, 2001). Pain is, in part, an affective experience that exists along a continuum as a warning signal of possible illness or injury. It may be a manifestation of an advancing or receding pathological state, but it is largely symptomatic. It acts as a means to indicate potential injury, illness, or danger. From this perspective, dental pain is a functional means to signal the possibility of a developing or ongoing disease state that requires attention to determine the effect on intraoral structures and on overall systemic

health. Of course, persistent pain that extends beyond an expected recuperative period is considered chronic and nonfunctional, as in temporomandibular disorder or atypical odontalgia (see Chapter 9). In such cases, emotional and environmental factors often strongly influence the pain experience, and require in-depth examination and attention.

Pain has the ability to alter behavior and motivate individuals to seek treatment. When a person is experiencing dental pain, particularly when it is intense, the pain can become a consuming sensory experience, making it difficult for the individual to maintain normal functioning throughout the day or to sleep at night. When dental pain is experienced by a patient with dental care-related fear and/or phobia, stimulus intensity may be the primary factor in determining how that patient responds (Vowles et al., 2006) and at what point they seek care. Pain intensity, in part, determines the rapidity with which a person seeks dental care; whether an individual is someone who receives regular preventative oral health care or seeks dental care only symptomatically, pain acts as an equalizer, prompting and at times even demanding intervention.

Pain typically is experienced when an aversive stimulus activates myelinated A-delta or unmyelinated C-fibers that send signals to the brain; however, dental pain, specifically pain from tooth pulp, is uniquely different. Tooth pulp seems to be innervated differently compared to other areas of the body, with the A-delta fibers ending within the inner third of the dentinal tubules and the C-fibers ending in the tooth pulp (Hildebrand et al., 1995; Fried, Sessle, & Devor, 2011). Exposing skin to air puffs or water spray typically does not result in a nociceptive response, but when that same stimulation is applied to tooth pulp (exposed dentin), the result is (often intensely) painful. The unique nature of dental pain makes it difficult to generalize to other forms of bodily pain. It may be that an individual could endure intense or longer duration painful stimulation in other areas of the body and less in the oral cavity, or

vice versa. Nevertheless, there is some evidence that the way that a person views other forms of bodily pain (e.g., via a cold pressor test) are predictive of postoperative dental pain after a surgical extraction (Mobilio et al., 2011). Currently, there is a need for further research that compares painful stimulation in different parts of the body, including the oral cavity.

In addition to the physical sensations of dental pain being unique, specific verbal descriptors have been found to be associated with toothache. Melzack's (1975) research with the McGill Pain Questionnaire found that toothache is associated with sensory words: "throbbing, boring, and sharp"; an affective word: "sickening"; evaluative word: "annoying"; and temporal words: "constant and rhythmic" (Dubuisson & Melzack, 1976). These verbal descriptors are specific to the experience of one form of dental pain (i.e., toothache) and may differentiate between irreversible disease versus a potentially treatable condition, based on the type of description the patient offers (Grushka & Sessle, 1984).

Oftentimes, external observers (e.g., dentists, hygienists) attempt to understand an individual's pain experience, while trying to prevent or ameliorate it, and may make a judgment that the pain is less or more intense or emergent, relative to the level of expression. Assuming that pain is actually being experienced (and the patient is not malingering), the external observer may be accurate, or may underestimate or overestimate; however, it does not change the person's experience. The expression of pain may be utilized to communicate to others one's level of discomfort; however, it also may function to modify the behavior of others. Report of the onset of new acute pain (Ow!) during a procedure likely elicits a more attentive and rapid response by a dentist than a patient's report about being fearful. For example, when the patient in the dental chair says "Ouch!," the dentist typically will respond by stopping what she or he is doing. Therefore, a patient learns that by expressing pain to the dentist, he or she can change the present course of action and

temporarily avoid the dental procedure. A highly dentally fearful patient may utilize pain expressions (even nonconsciously) as a means of escape or avoidance, when in reality the person is experiencing a state that external observers would regard as fear, not pain. Pain and fear (as well as anxiety) are inextricably linked in the dental operatory (McNeil & Berryman, 1989; McNeil et al., 2011; Wilson et al., 2013). Importantly, communication from patients within healthcare settings functions not only to relate meaning, but also to elicit certain clinician behaviors and outcomes, such as stopping the dental drill.

Environmental Determinants

Aspects of the environment are powerful and distinctive determinants of dental pain. Within the dental operatory, and the dental clinic, there are a myriad of stimuli that signal, or cue, to the patient that a particular event is about to occur. The stimuli within the dental operatory and clinic typically are infrequently experienced by patients, and so are unique and may even retain novelty over time. The social aspects of the dental environment are important signaling factors that are influential in patients' overall experience. From the behavior of the receptionist, to the ambiance in the waiting room, and of course including the interactions with hygienists and dentists, social interactions and communication contribute to the general environment in the dental setting that affects patients' processing, conceptualization, and response to nociception. The dental environment and the cues therein "set the occasion" for anticipation of sensations during dental care. Some cues likely sensitize certain patients, making them more vulnerable. In other cases, however, they allow realistic expectations, such that there is a higher threshold and tolerance for pulp stimulation, for example, in a dental setting than in a psychological laboratory (Dworkin & Chen, 1982). These factors, as well

as other aspects of the environment, such as predictability and control, are presented with consideration of their impact on pain.

Dental Personnel

Dentists, hygienists, assistants, and even receptionists, just like other “stimuli” in the dental office, such as dental chairs, can be associated with pain and may elicit a fear response in highly fearful patients. Similar to links in a chain, there may be several degrees of separation from seeing the receptionist to injection or drilling, but the conditioning that occurs in this environment can, and often does, pair with preceding stimuli. Patients may respond with verbal reports of distress, psychophysiological responding, or may choose to escape the situation entirely as a result of coming into contact with these environmental cues, or even anticipating them. A dental cartoon from the popular press portrays a patient saying “ouch” even as a dentist merely enters the treatment room (Shepherd, 1991). This cartoon exemplifies the blend of fear and pain that often is experienced during dental care (McNeil & Berryman, 1989; McNeil et al., 2011).

While all dental personnel may be viewed as potential “fear stimuli,” dentists may be the most negatively viewed, given that they conduct the most (potentially) painful procedures. They even can be regarded as “purveyors of pain,” yet may be seen (even simultaneously) as a means to relief and an end to suffering. When a dentist provides relief from ongoing dental pain, the process of “negative reinforcement” occurs, in that the dentist has removed or reduced pain for the patient, thus increasing the likelihood he or she will visit the dentist for this problem in the future. Nevertheless, the patient may not consistently have positive experiences, or the positive experiences may not override a highly fearful patient’s prior experiences, but each positive encounter has the potential to help alleviate some of the fear and other discomfort associated with dental care.

Relationships with Oral Healthcare Providers and Communication

The social aspects of the relationship between dental patient and oral healthcare provider may seem to be secondary to procedures that are employed in the operatory vis-à-vis pain. Nevertheless, these relationships significantly impact the experience and expression of pain, and affect the maintenance of oral health behaviors (Grembowski, Andersen, & Chen, 1989; Kent & Blinkhorn, 1991). A patient’s view of the quality of this relationship predicts a number of outcomes, including treatment adherence, appointment attendance, and satisfaction (Sandell, Camner, & Sarhed, 1994; Sinha, Nanda, & McNeil, 1996). Lower reported pain levels are associated with greater social support (e.g., active or passive) during the pain experience, as compared to experiencing the pain alone (Brown, Sheffield, & Robinson, 2003). Individuals who experience painful stimulation in a group setting have been shown to match the responding of others in the group (Craig & Weiss, 1971). The concept of social modeling suggests that others can be influential on one’s behavior, which includes pain responding. For example, adolescent patients who received attentive care and more attention from parents recovered more slowly from oral surgery (Gidron, McGrath, & Goodday, 1995).

An important component of the provider–patient relationship is communication. One study demonstrated that patient attitudes about the quality of a past appointment were significantly different between patients who discussed an orofacial problem with a healthcare provider versus with a layperson (e.g., spouse, relative, friend). Interestingly, those patients who perceived poorer quality relationships with healthcare providers, and were less likely to discuss a pain problem with the provider, were at greater risk for developing health problems associated with not receiving appropriate dental care (Riley, Gilbert, & Heft, 2004). In addition, two facets of communication content have been

found to have an effect on pain responding: provider confidence and provider behavior that is described as “warm and friendly” (Gryll & Katahn, 1978). Patients indicated that when providers communicated confidence in an intervention, they reported less pain than when the provider was ambivalent about the treatment approach. Patients also reported less pain when the provider was “warm and friendly” and actively elicited discussion and questions from patients, relative to providers who were more neutral and less talkative. Therefore, communication quality and content of communications between patient and provider, like other aspects of the overall environment in the dental office, affects not only the relationship but the experience and expression of pain as well.

Distraction

Distraction, or shifting the patient’s attention away from environmental procedural cues, and away from the sensory aspects of a painful situation to another more pleasant stimulus, has long been successful in lessening pain (Kent & Blinkhorn, 1991). Due to the acute and transient nature of procedure-related dental pain, the use of distraction often is quite successful, as it moves the focus away from the current environment. Distraction may be as simple as listening to music or as technologically advanced as virtual reality; however, it seems to be increasingly effective as more sensory systems are involved. Seyrek, Corah, and Pace (1984) found that watching a television program or playing a video game was more effective at reducing patient discomfort than listening to an audiotape. Both simple and complex virtual reality systems have been implemented as a means of distraction. Frere et al. (2001) found that dental prophylaxis patients experienced less pain when exposed to positive and distracting virtual reality versus treatment as usual. Hoffman et al. (2001) compared the use of an immersive virtual reality distraction, a movie distraction, and no distraction during periodontal scaling and root planing. Higher pain ratings were found during

the movie and the no-distraction conditions, while little to no pain was indicated during the virtual reality intervention.

As another form of distraction, hypnosis is helpful to many dental patients. Hypnosis, however, is likely to be more than a distraction in many cases, as there are broader and different conceptualizations, including relaxation, suggestibility, and trance states. Hypnosis has been shown to be effective in altering the experience of pain. As an example, one study involved giving participants a hypnotic suggestion for anesthesia of the right mandibular arch that was to last during and after pain stimulation with a pulp tester. Pain threshold was measured before, during, and after the hypnotic suggestion. During and after hypnosis, pain threshold was significantly higher than in the prehypnosis condition (Facco et al., 2011). There is a long history of effective use of hypnosis for pain control in dental settings (see Chapter 6 in this volume).

Predictability

Predictability is the degree to which the presence or absence of an environmental signal indicates the onset, offset, duration, or intensity of a stimulus or event; in the case of dental care, it is whether or not the patient knows what will occur during dental treatment, how and when it will happen, and for how long. Predictability (along with controllability) impacts the experience and expression of pain and distress during dental care. Affective states, including fear and anxiety, impact patients’ ability to accurately predict dental pain experiences (e.g., Van Buren & Kleinknecht, 1979). Moreover, as fearful individuals in general overpredict aversive events, presumably as protection from potential harm (Arntz & Hopmans, 1998), predictability in the dental setting is extremely important as pain can be highly influenced by fear and anxiety. The primary approach to increasing dental patients’ predictability has been the provision of information by providers. The type and amount of information provided to dental

patients is important, as is the patient's preference for it. Providing information about both the potential procedural and sensory experience appears to be the most beneficial for patients (Corah, Gale, & Illig, 1979). Nevertheless, simply providing information does not insure that the patient will listen (or read), encode the facts, or understand them (Sorrell et al., 2009).

There has been considerable investigation of providing information about procedures to dental patients. Patients lacking predictability about a tooth extraction procedure, for example, displayed greater pain behavior compared to patients who were informed and able to predict what would occur in treatment (Auerbach et al., 1976). Relatedly, giving information about nitrous oxide enhanced its pain control effects in tooth pulp shock (Dworkin et al., 1984). As root canal therapy is portrayed so negatively and is associated with intense pain in the popular press, some work has been devoted to studying the impact of corrective information. Sorrell et al. (2009) found that even viewing a 5-minute film yields greater knowledge among endodontic patients. Additionally, positively written information about endodontic therapy was found to produce reduced fear of dental pain (van Wijk & Hoogstraten, 2006).

While more information generally increases predictability and decreases the experience of pain and anxiety, some individuals prefer less information to cope with potentially painful situations. This individual difference is based on two different types of coping styles known as monitoring and blunting (Miller, 1995). Patients who prefer more detailed information (i.e., "monitors") often are more concerned and distressed with their medical condition, experience greater side effects, are more knowledgeable about their situation, and are less satisfied and more demanding about the psychosocial aspects of care as compared to patients characterized as "blunters." These blunters prefer less information and if provided with too much detail may experience disruption in their avoidance coping. As a related example, when tooth

extraction patients had a preference to receive procedure- and sensory-related information and then received information about treatment, pain and distress responding was significantly reduced compared to patients who received information but had no such preference for it (Auerbach, Martelli, & Mercuri, 1983).

Numerous studies have examined the influence of coping styles and information in health-care settings (van Zuuren et al., 2006; Forys & Dahlquist, 2007; Kola et al., 2013). Forys and Dahlquist (2007) examined the effect of matching an individual's coping style to a coping strategy (i.e., distraction or sensation monitoring) during a laboratory pain induction study. By matching coping style to the appropriate coping strategy, both pain threshold and tolerance were increased, but without reductions to pain intensity, affect, or anxiety. While there are a number of other ways in which coping style can be conceptualized (e.g., emotion-focused, problem-focused, or passive), the monitoring-blunting dimension is helpful in understanding the amount and type of information that is provided to dental patients anticipating potentially painful procedure(s). Because of the connection between anxiety/fear and pain, research suggests that by matching patients' coping style to the appropriate amount and/or type of information or coping strategy, they may experience reduced anxiety and perhaps less pain.

Warning patients about potential pain, and responding to a patient's direct question about whether a procedure will be painful, are classic examples of information provision in dentistry. Authenticity and honesty are, of course, important in terms of the relationship between the provider and patient. Nevertheless, labeling an anticipated sensation as painful likely will insure that the patient experiences it as pain. Focusing on the specific *sensations* patients likely will experience, rather than on the broader experience of pain, helps them to label the experience in a more positive way (cf. Neiberger, 1978).

Considering patients' anticipation or prediction of pain (or comfort) during dental care, van

Wijk and Hoogstraten (2005) have focused on fear of dental pain, and have developed a specific measure of that construct, based on the Fear of Pain Questionnaire-III (McNeil & Rainwater, 1998). Patients with high degrees of fear of dental pain have been found, during dental injections, to feel more pain and to experience it for longer periods (van Wijk & Hoogstraten, 2009). Pain during third molar extraction is predicted by fears of dental pain (van Wijk, de Jongh, & Lindeboom, 2010). This fear of dental pain construct is a heuristic for the understanding of the intersection of dental pain and fear/anxiety. This area of investigation has a significant benefit in that assessment instruments with known psychometric properties are available and have been translated into various languages (e.g., McNeil & Rainwater, 1998; van Wijk & Hoogstraten, 2003).

Controllability

The ability of a patient to alter the onset, offset, duration, or intensity of a dental experience, in essence, whether or not the patient is able to influence what happens during treatment, defines controllability (Arntz & Schmidt, 1989; Foa, Zinbarg, & Rothbaum, 1992; Zvolensky, Lejuez, & Eifert, 2000). Controllability can be conceptualized in terms of actual control and perceived control; actual control involves responding which leads to an environmental change, while perceived control refers to the belief that an event can be structured, contained, or altered (Walker, 2001). Giving control, or increasing perceptions of control, during pain stimulation can increase pain tolerance (Kanfer & Goldfoot, 1966; Kanfer & Seidner, 1973; Haythornthwaite et al., 1998). Encouraging patients to raise a hand as a “stop signal” if they experience pain is a classic chairside method that has been shown to reduce reports of pain (Wardle, 1982), which likely is mediated through fear reduction. The pain-reducing effects of actual control are dependent on the patient’s own locus of control, which exists along a continuum from internal (“If I brush regularly, I can prevent

cavities.”) to external (“My mother had all her teeth extracted by the time she was 40, so I probably will, too, regardless of what I do. My family just has ‘soft’ teeth.”). Patients with more internal locus of control benefited from having greater actual control during treatment, while those with more external locus of control had greater physiological response during treatment and did not benefit from having actual control (Corah, Bissell, & Illig, 1978).

In the dental setting, perceived control has been the primary focus for experimental intervention, more so than actual control. Truly, dental providers and patients share control; each “chooses,” in part, to be present in the dental situation. A number of studies have shown that greater perceived control decreases the experience of pain during dental treatment (e.g., Corah et al., 1979; Thrash, Marr, & Boone, 1982).

Another perspective on the utility of control in the dental setting is the desire for control versus the level of control experienced (Law, Logan, & Baron, 1994). When desire for control is high and felt control is low, dental fear is the highest (Logan et al., 1991; Baron, Logan, & Hoppe, 1993) and pain-related distress is the greatest (Logan et al., 1991; Baron & Logan, 1993). Based on this information, interventions designed to increase felt control among high desire/low felt control patients have been successful in decreasing distress ratings during dental treatment (see Baron & Logan, 1993, for a review).

Emotional Determinants

A variety of affective states, including anxiety, fear, stress, panic, and depression, among others, are potentially important in the experience and expression of pain (Keefe et al., 2001). Within the dental clinic, providers frequently encounter patients with high levels of anxiety and fear. Patients with high levels of anxiety, fear, or stress, for example, may be predisposed to experiencing nociception as painful, or con-

versely may find that it attenuates pain (McNeil, 1993). van Wijk and Hoogstraten (2005) found that highly anxious dental patients, who were naïve to certain procedures, overestimated their fear of specific dental pain relative to others who already experienced the pain or procedure. Therefore, the highly anxious patients who experienced the pain or procedure rated it lower than those who had not experienced it, and instead assumed (likely due to their dental anxiety) that the pain would be worse. Additionally, neuroimaging studies have shown that activity in pain pathways can be altered by attentional state, positive and negative emotions, stress, empathy, and the use of placebos (Loggia et al., 2008). Through prevention or reduction of anxiety and fear, either pharmacologically, behaviorally, or in combination (Milgrom & Heaton, 2007; Milgrom, Weinstein, & Heaton, 2009), improving mood, and focusing attention away from the pain, patients can better participate in their own treatment and effectively decrease their pain experience.

When considering theories of dental pain in the context of anxiety and fear, broader theoretical conceptualizations can be modified and applied to understand the mechanisms of action in the dental setting. Models that can relate fear and anxiety about pain applied to the dental context will be considered, including Mowrer's two-factor theory, Davey's model, the fear-avoidance model, and the expectancy model of fear. Each of these theories will be briefly addressed; however, a new model, based on acceptance, also will be presented, as it is a developing theory within the pain literature.

Mowrer's Two-Factor Theory

Mowrer's (1939) two-factor theory was among early theoretical conceptualizations that attempted to bring meaning and understanding to fear and avoidance behavior. Using a classical conditioning framework, Mowrer postulated that a neutral stimulus acquired aversive properties in the presence, and temporal contiguity of, a fear-evoking event. When aversive

stimuli are avoided, fear is reduced and, therefore, avoidance behavior is maintained (i.e., negative reinforcement). Stimuli associated with a dental operatory, such as the dental chair, drilling sounds, and odors, act as conditioned stimuli (CS), because they are not independently painful, but are present just prior to an unconditioned stimulus (UCS) that is painful (e.g., upper palate injection), which results in the patient having a fearful reaction (unconditioned response; UCR). After the previously neutral stimuli have been paired with the painful stimuli, resulting in the fear response, the previously neutral stimuli (e.g., dental sights, sounds, smells) may elicit a fear response without having the painful stimulus present. This fear response to nonthreatening stimuli is referred to as the conditioned response (CR). When the patient who has developed the CR to dental stimuli then avoids the dental office, this behavior results in the absence or reduction of fear and maintains nonattendance behaviors. Operant conditioning therefore follows the initial classical conditioning (i.e., Mowrer's two-factor theory). Since the introduction of Mowrer's theory, newer models have been developed involving cognitive factors as well as other variables. Davey's model expands the conditioning process to account for cognitive appraisal.

Davey's Model

Davey (1989a) developed a model for dental phobias, anxieties, and fears that suggested two explanations in which painful dental-related events may *not* lead to future fears of dental pain. In the model, Davey asserts that with many positive experiences between arbitrary stimuli (e.g., dental chair; CS) and the *absence* of a painful stimulus (e.g., an injection; UCS), a fearful response (CR) is more difficult to establish, even if the painful stimulus later occurs in the presence of the arbitrary stimulus. *Latent inhibition* is a term that has been used to describe the observation that a familiar stimulus (e.g., dental chair) takes longer to acquire meaning as

a conditioned stimulus than a new stimulus. Thus, the association that can develop over many years of painless treatment between attending dental appointments and positive experiences with oral health care can be too strong for a UCS–CR association to be effectively established. Additionally, Davey includes the importance of cognitive appraisal in his model, recognizing that if the patient does not interpret the UCS (e.g., painful injection) as being highly negative, the association will not be made between the CS (e.g., dental chair) and UCS. Therefore, the strength of the CR (e.g., fear response) depends on the patient's evaluation of the UCS (e.g., injection; Davey, 1989a,b; Davey & Craigie, 1997). Davey's model and novel inclusion of cognitive appraisal allowed for continued exploration of theories related to the fear of pain, including the fear-avoidance model applied to chronic musculoskeletal pain-related problems (Vlaeyen & Linton, 2000).

Fear-Avoidance Model

The fear-avoidance model (Lethem et al., 1983) asserts that physical strain or injury is followed by the experience of pain, which leads to either of two responses. The patient may experience little or no fear about the context in which the pain occurred, or the associated stimuli, resulting in a return to his or her level of functioning prior to the injury, or the patient may catastrophize about the pain and the context in which it occurred. The tendency to catastrophize leads to a perpetuating cycle of increased fear of pain, avoidance of the setting or context of event, and potential disability. Therefore, how the patient evaluates and responds to pain will greatly influence the outcome. For example, two patients may have the same dental procedure with the same difficulties, but one may persevere on the aversiveness of the pain, resulting in an increase in fear of dental pain, while the other may recognize the pain and discomfort, but feel satisfied with the procedure and relieved to have the medication following treatment,

resulting in a return to a level of functioning prior to the painful event.

The development of fear of pain, in conjunction with general fears about dentistry, appears to have a negative effect on adherence within oral healthcare settings (Vowles et al., 2005). With greater avoidance of preventive treatment and less adherence to oral health behaviors, the risk of oral disease and pain increases. When a patient finally seeks treatment, procedures that may have incurred little or no pain may become much more painful due to the lack of oral care, increasing the fear of pain associated with the dental operator, leading to a vicious cycle of fear/anxiety and pain (Weinstein, 1990; Armfield, Stewart, & Spencer, 2007). Norton and Asmundson (2003) added physiological responding to the fear-avoidance model. They suggest that it is a patient's experience of physiological arousal (e.g., during dental treatment), and the belief that treatment may lead to pain or lasting harm (e.g., a catastrophe in the dental chair, such as myocardial infarction), that initiates fear (see Norton & Asmundson, 2003, for a review).

Expectancy Model of Fear

The expectancy model of fear (Reiss & McNally, 1985) is based on two components: (a) expectations that certain events and/or experiences (e.g., heart palpitations, embarrassment, or losing control of emotions) will occur in particular situations, and (b) anxiety sensitivity, which refers to the belief that the expected experiences are dangerous or threatening. When paired together, these factors influence behavioral responses in the context of (potential) threat, and in particular, avoidance and escape behavior.

Anxiety sensitivity is a predisposing factor linked to fear responding to nonthreatening events (Reiss, 1991) and to the development of anxiety disorders (Craske, 1999). While much of the research for this model is related to anxiety disorders (e.g., Taylor, Koch, & McNally, 1992) and chronic pain (e.g., Zvolensky et al., 2001; Greenberg & Burns, 2003), it has been applied

to the dental setting, substituting instead the concept of pain sensitivity. Both constructs are based on the same fear learning model and are closely related (Gross, 1992a,b). Gross (1992a) applied the expectancy model of fear to dental avoidance with the development of the Pain Sensitivity Index (PSI). Using the PSI, Gross found that pain sensitivity among dental patients predicted pain intensity, and pain intensity predicted dental avoidance. The maintenance of avoidance behavior occurs through negative reinforcement in which fear is reduced when dental care is avoided and the reduction of fear increases the likelihood of the avoidance response in the future. Additionally, patients with a high level of dental anxiety/fear who also scored high in anxiety sensitivity both expected and experienced more pain than those who scored low in anxiety sensitivity (Klages et al., 2006).

Acceptance-Based Models

Based on the third wave of cognitive-behavioral interventions, acceptance has its roots in both psychological and philosophical theories. Acceptance-based treatment, specifically Acceptance and Commitment Therapy (ACT; Hayes, Strosahl, & Wilson, 2012), has been successfully implemented with chronic pain patients and shows promise in helping patients cope with pain. Acceptance emphasizes relinquishing one's internal struggle with what *should* be happening and what is actually happening in the present moment. There are several different acceptance-based models for treating psychological and other health problems; for the purposes of this chapter, the focus will be on ACT as it has been implemented for patients with pain. ACT is based on functional contextualism, a concept that involves how an individual interacts with every part of the environment, currently and in the past, and the function (or purpose) of one's behavior in the environment (Hayes, 1993).

ACT explains the development of psychological problems as primarily occurring because

of the way that thinking and language interact with internal physical/psychological states (e.g., pain) that can yield an "inability to persist or change behavior in the service of long-term valued ends" (Hayes et al., 2006, p. 6). In other words, an individual who develops psychological inflexibility is in a constant struggle with his/her thoughts and behaviors, causing distress. ACT encourages releasing oneself from this internal struggle and accepting the realities of life without judgment.

ACT encourages acceptance of one's problems, especially those issues that cannot be changed, and it therefore, lends itself well to treating chronic pain. Several studies have found that the use of ACT has reduced patients' reports of pain and has shown improvements in emotional, social, and physical functioning, and reduced healthcare utilization for those suffering from chronic pain (see Vowles & Thompson, 2011, for a review). Moreover, this review suggests there is evidence that chronic pain patients with higher levels of psychological flexibility (a component of ACT) report fewer pain-related healthcare visits, as well as better emotional and physical functioning.

With regard to acute pain, several studies have now shown that experimental interventions designed to facilitate acceptance of pain are related to increased pain tolerance and reduced pain-related distress (e.g., Hayes et al., 1999; Gutierrez et al., 2004; Keogh et al., 2005; Branstetter-Rost, Cushing, & Douleh, 2009). While there are no studies that have been performed in dental settings, it seems likely that acceptance-based strategies would be useful, as discomfort experienced in the dental operator often is out of the patient's control, and some of it is unavoidable. As applied to dental care, an ACT approach would encourage patients to "let go" of trying to control what cannot be controlled in the dental setting, clarify what is important about getting dental treatment and how it will help them live more comfortably and fully, and instead to notice their internal experience during the procedure, without judgment or struggle, so that then

they may be more tolerant of the overall experience.

Cognitive Determinants

Pain is a multifaceted experience that it is a combination of physical sensation and how that sensation is perceived and expressed. Pain perception is determined by past learning experiences, as well as by cortical and other central nervous system processing of nociceptive and other inputs. Several areas in the brain have been associated with pain processing, including the primary somatosensory cortex, secondary somatosensory cortex, insula, anterior cingulate cortex, and prefrontal cortex (Treede et al., 1999). These and other components of the nervous system provide the infrastructure for the cognitive processing of oral and other pain. Previous research has defined the pain experience as having sensory-discriminative, affective-motivational, and cognitive-evaluative components (Melzack & Casey, 1968). The sensory-discriminative component consists of stimulus localization, intensity discrimination, and quality discrimination. The affective-motivational component is related to the emotional aspect of pain (e.g., "This pain is horrible!"), arousal (e.g., increased heart rate), and behavioral response (e.g., avoidance, escape). The cognitive-evaluative component includes attentional processes, anticipation, and memory for past experiences of pain (Peyron et al., 1999).

Cognitive processes that establish, maintain, and alter memories of dental pain are critically important in terms of patients' perceptions of the dental experience and their future plans for prophylactic and other return visits. Level of dental anxiety/fear consistently has been found to affect memory of oral pain (Kent, 1985). Dental pain and anxiety consolidate in memory, as a single construct, over time (McNeil et al., 2011). There is evidence for specificity of the pain response among persons with high levels of dental anxiety/fear in that Klepac et al. (1980)

found that these individuals retrospectively judged tooth shock, but not arm shock, as more painful, relative to a low fear comparison group.

Dental patients with high anxiety tend to have greater expectations and recall of pain, with these patients remembering more pain 3 months following a procedure than immediately after it (Kent, 1984, 1985). Incubation effects (i.e., pain being remembered worse than reported at the time of the procedure) appear to exist at least among patients with high dental fear/anxiety (Kent, 1985), although enhanced anxiety may be the primary operative factor (McNeil et al., 2011). Oral surgery patients' memories of pain have been examined along with reports of anxiety (McNeil et al., 2011; Wilson et al., 2013). As a group, oral surgery patients recalled more procedure pain relative to what was reported immediately after the procedure, but only those high in trait dental anxiety had exaggerated recall of anxiety (McNeil et al., 2011). Additionally, highly anxious patients reported more pain prior to the procedure and expected more pain during the procedure. Therefore, many dental patients may recall pain being worse than was actually reported at the time of a procedure, which could function to reinforce avoidance in patients with high dental anxiety/fear.

Moderate (conscious) sedation during oral surgery has the desired effect of being associated with memory of less pain and anxiety 1 month after the procedure (Wilson et al., 2013). These moderate (conscious) sedation effects also were studied in dental implant patients (González-Lemonnier et al., 2010) in regard to preoperative anxiety and postoperative satisfaction following surgery. Patients with high preoperative anxiety reported a lower level of satisfaction compared to those with low preoperative anxiety. Memory of acute dental pain is an important area of contemporary investigation. Its conceptual intermingling with anxiety and fear is a focus that prompts greater understanding of all of these interactive states.

Catastrophizing is a cognitive tendency to focus and ruminate on negative outcomes in

events an individual perceives as being threatening. Sullivan and Neish (1998) examined catastrophizing among patients during dental hygiene treatment and found, after statistically controlling for gender and oral hygiene status, catastrophizing significantly predicted pain. Dental patients with a tendency to catastrophize may focus intently on (potential) pain and may worry excessively prior to treatment about pain. Evidence also shows that catastrophizing may act to maintain other oral health problems, especially those related to stress (Turner et al., 2001; see Chapters 9 and 15 in this volume).

Individual Differences

Threshold and tolerance varies widely in regard to pain in general, which applies also to oral pain. As with other forms of pain, a variety of individual differences affect response to (potential and actual) pain in the dental operatory. Several studies have concluded that patients with higher levels of dental anxiety and fear responded with more sensitivity to pain (i.e., less pain tolerance) during treatment (e.g., Kleinknecht & Bernstein, 1978), are more likely to report dental pain (Vassend, 1993), and have greater likelihood of irregular dental attendance (e.g., Milgrom et al., 1985).

Recently, researchers have found that certain genetic expressions seem to be related to greater pain sensitivity. Individuals with variants of the melanocortin-1 receptor (MC1R) gene, which are associated with red hair color, seem to have greater pain sensitivity and reduced sensitivity to general and cutaneous local anesthesia, and therefore require more medication to produce adequate anesthesia (Liem et al., 2004, 2005). Because this gene has been found in brain pathways associated with processing pain, anxiety, and fear (Xia, Wikberg, & Chhajlani, 1995), Binkley et al. (2009) tested the hypothesis that having natural red hair color, an MC1R gene variant, or both, would predict a patient's dental anxiety and avoidance. The authors found that individuals with MC1R gene variation reported

having more dental anxiety and fear of dental pain than those without the gene variant. Interestingly, the authors suggest that potentially up to 97% of red-haired Caucasians and 26% of dark-haired Caucasians have variants of the MC1R gene that may be related to differences in pain experience and, relatedly, dental care-related fear (Binkley et al., 2009). The increased dental anxiety and fear of dental pain in individuals with this gene variant is logical, considering they likely experienced more pain during procedures, perhaps due to greater pain sensitivity, or to being under-anesthetized, or both. Similarly, across a family-based sample that varied along the continuum of oral healthcare-related anxiety and fear, both dental fear and fear of pain were found to be highly heritable (Randall et al., 2012). Continued research on the influence of genetic and biological predispositions should provide valuable information in understanding individual differences in the experience and response to dental pain.

Gender, Culture, and Lifespan Issues

In addition to individual psychological characteristics affecting oral pain, the patient's social background, including age, gender, socioeconomic status (SES), and culture all interact with the environment, thus impacting learning history, which influences pain experience and expression. Younger individuals are more likely to report pain, while older adults of high SES are less likely to report pain (Pau, Croucher, & Marcenes, 2003). The prevalence of certain types of dental pain varies across the life span, with a decrease in toothaches over time and an increase in burning mouth syndrome, for example (LaRusche, 2001). Cox (2000) suggests that oral health practitioners tend to underestimate the severity of pain in the elderly, based on a study that reported nonelderly patients were more likely than the elderly to receive pain medication, within a shorter period of time, and at a higher equivalent dose (Jones, Johnson, & McNinch,

1996). In a population-based sample, Heft et al. (2007) found that women reported more fear of dental pain, while males reported less such fear. Individuals from lower SES backgrounds may have less experience with dental care from a young age and therefore may be more uncertain of what to expect during dental treatment. Patients of lower SES report greater orofacial pain and have greater behavioral impact from the pain as compared to those with high SES (Riley et al., 2004). Cultural background may predispose patients to greater or lesser pain expression; additionally, emotions associated with pain may differ across cultures (Lipton & Marbach, 1984).

The gender and cultural status of the dentist, hygienist, and other dental personnel in the office or clinic can influence a patient's response to pain, and how it is treated and labeled in the clinic. Responses to painful stimulation may vary, depending on gender matching or discontinuity between provider and patient (Rollman, Lautenbacher, & Jones, 2000; Carter et al., 2002; Vowles et al., 2006). Men are less likely to verbally report fear in response to dental pain especially if the provider is female; women indicate greater avoidance of pain, less acceptance of pain, and greater desire for control (Liddell & Locker, 1997).

Summary and Conclusions

Dental and other orofacial pains are ubiquitous, multifaceted experiences influenced by biological, environmental, emotional, and cognitive factors. In spite of dental technologies and pharmacologies that are ever-evolving with greater sophistication, dental pain continues to be a concern for patients, individuals who are considering dental treatment, and oral healthcare providers.

The unique nature of the dental environment, and of dental treatment itself, contributes to anticipation of and fears and anxieties about pain. Dental care-related anxieties and fears are intertwined with pain, sharing modes of expression.

Orofacial pain shares similarities with pain in other areas of the body, yet in some respects also is unlike other pain experienced in different regions due to the interaction of biological (e.g., innervation, genetics), environmental (e.g., stimulus characteristics of the dental operatory, provider communication), emotional (e.g., anxiety, fear, stress, depression), and cognitive (e.g., catastrophizing, memory) components. Finally, patient characteristics (e.g., age, gender, race, ethnicity, culture, SES, and other sociocultural factors), and how they interact with the characteristics of dental providers, affect the experience and expression of dental pain.

Oral healthcare professionals are in a challenging role in working with patients to prevent and control pain, simultaneously targeting fear as well. Patient expectations about "painless" dentistry may be so high that many forms of discomfort will be judged as unacceptable. Nevertheless, a positive and proactive approach to pain management, using the principles and methods described in this chapter, hopefully will help oral healthcare professionals provide the best standard of care in such a way as to decrease reactivity and psychological distress, helping patients to learn ways to use healthy coping strategies in relation to their dental experiences.

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Cosmetic Dentistry: Concerns with Facial Appearance and Body Dysmorphic Disorder

Ad De Jongh

Key points

- The more dissatisfied people are with their teeth, the greater their desire for treatment to correct a perceived imperfection.
- The desire to make changes to appearance could be a symptom of a lack of self-worth, negative self-image, or a psychiatric condition called body dysmorphic disorder (BDD).
- It is important to remain vigilant and practice restraint with patients with unusual esthetic requests.
- There is no support for the notion that cosmetic dental treatment leads to long-term improvements of happiness or quality of life.

Appearance is considered important by many as it is assumed to provide the opportunity for obtaining attention, love, recognition, and validation from the environment. Indeed, attractiveness appears to be associated with achieving happiness in life. Research has shown that the more attractive a person is, the more likely it is that he or she will achieve greater profes-

sional status, a higher income, and more happiness (Umberson & Hughes, 1987). The additional attention attractive children receive from people, not only from parents but also—for instance—from teachers at school, may create opportunities for them to flourish, thereby stimulating self-confidence and intelligence. This results in physically attractive people being

seen as smarter and more competent later in life (Beehr & Gilmore, 1982; Shahani, Dipboye, & Gehrlein, 1993). Hence, if a person meets the criteria for attractive appearance, the odds are that his or her life will be good. Conversely, of individuals who feel they do not fulfill the norm for beauty, life can be unbearably painful, empty, or lonely.

In fact, very few people are 100% satisfied with their appearance. The results of a survey among a representative sample of the Dutch population for which people were asked about how they felt about their own body showed that about half of respondents felt they were unattractive, ugly, disfigured, or not beautiful enough (De Jongh et al., 2006; Gresnigt-Bekker et al., 2008). It appeared that 38% of men and 61% of women were dissatisfied with their appearance. Participants were also asked to indicate which parts of their bodies they were unsatisfied with (see Table 8.1). The majority found their belly to be the least attractive body feature. Men placed their teeth fifth on the list of most unattractive features. People's dissatisfaction with their appearance in a general sense was also found to be positively associated with dissatisfaction about their teeth (Gresnigt-Bekker et al., 2008).

Given these findings, it is conceivable that the more dissatisfied people are with their teeth, the greater the desire for treatment to correct this perceived imperfection (Klages, Bruckner, & Zentner, 2004).

This chapter focuses on the dissatisfaction people have with their appearance and their

striving to improve it. Although many people expect improving their teeth will make them happier, this notion may be less logical than it seems. This holds true specifically for people with an actual obsession regarding their teeth, a psychiatric syndrome called body dysmorphic disorder (BDD), which can be a real scourge for dentists, orthodontists, and oral surgeons. This chapter addresses a number of dangers and common pitfalls regarding the dental treatment of patients with excessive desires, particularly those suffering from BDD, and provides some guidelines and tips for dealing with these patients.

Cosmetic Interventions Increasingly Popular

Cosmetic or esthetic interventions have grown in popularity in recent years. In 2009 alone, over 1.6 million Americans underwent such treatments, an increase of 155% compared with 1997 (American Society for Aesthetic Plastic Surgery, 2011). This increase includes both surgical treatments, such as breast augmentation and eyelid surgery, and nonsurgical treatments. The latter includes botox (botulinum toxin Type A) injections and laser hair removal. The greatest increase took place in the latter area, with a rise of 228% in the same period.

One reason often given for this increase in cosmetic interventions is media exposure. Reality TV programs such as the popular "Extreme Makeover," which have showcased all manner of new developments in cosmetic medicine over the past few years, are extremely popular. The assumption that these kinds of television programs play an important role in prompting people to undergo cosmetic interventions is supported by the results of a study among patients undergoing cosmetic surgery for the first time. Four out of five patients indicated that "beauty" programs on television influenced them in their decision to undergo such cosmetic surgery (Crockett, Pruzinsky, & Persing, 2007).

Table 8.1 Body Parts about Which People Are Most Dissatisfied (De Jongh et al., 2006)

Ranking	Men	Women
1	Belly	Belly
2	Head hair	Breasts
3	Facial skin	Legs
4	Feet	Bottom
5	Teeth/nose	Thighs

The same developments can be seen occurring in the field of dental cosmetic interventions. Dentists in New Zealand received numerous requests for cosmetic dental treatments after the TV program "Extreme Make-over" was broadcast (Theobald et al., 2006).

A full 85% of patients linked the desired dental treatment to this program. It appears that existing dissatisfaction with one's dental appearance is increased or strengthened by media attention and other forms of external information. It does not require a great deal of imagination to understand that this can affect feelings of self-worth. If self-worth is lacking, the likelihood of discovering physical imperfections increases, thereby further strengthening individuals' negative self-image. It is conceivable that many people consider hiding or changing their perceived physical imperfection by means of plastic surgery because they assume that this will increase their happiness and quality of life (QoL).

Do Cosmetic Dental Interventions Have a Positive Effect on Patient Happiness and Quality of Life? A Study

Intriguingly, despite the large number of dentists' web sites that essentially promise improvement in personal happiness and quality of life (QoL) following cosmetic dental work, until recently, research in the field of cosmetic dentistry was entirely lacking. One exception is a study that investigated whether personal happiness and QoL would indeed increase following cosmetic treatment (De Jongh et al., 2011). The experimental group consisted of 52 patients, with an average age of 46 years, who were about to undergo cosmetic treatment of their front teeth in one of the five cosmetic dental clinics that participated in the study. Treatments consisted of bleaching dental elements, application of veneers and crowns, or combinations of these interventions. Using a pretest-posttest

with control group design, the effects of cosmetic treatment of the front teeth were compared with those within a group of 51 patients with an average age of 53 years who underwent restorative, not primarily cosmetic, treatments in the (pre)-molar area during the same period. In addition to general questions (e.g., gender, age, education, relationship status, and ethnicity of the participant), questions were asked about satisfaction with dentition, importance of dentition, and happiness. Additionally, questionnaires were used to assess oral health-related QoL (as indexed by the Dental Impact Profile; Strauss & Hunt, 1993; Strauss, 1997) and general QoL (using the 12-Item Short-Form Health Survey, SF-12; Ware, Kosinski, & Keller, 1996). Assessments were carried out prior to treatment, 3 days after treatment, and 1 month after treatment. Intriguingly, no significant differences were found between the experimental and control groups in terms of satisfaction with dentition, importance of dentition, happiness, and general QoL prior to treatment and 1 month later. Furthermore, no differences were found in results for these variables between both groups. The most noteworthy result was that in the experimental group, rather than an increase, a significant decrease in oral health-related QoL following cosmetic treatment was found. These findings certainly do not support the assumption that cosmetic treatment of front teeth yields meaningful positive changes in satisfaction about dentition, happiness, oral health-related QoL, or general QoL. In fact, the contrary is true for oral health-related QoL. Apparently, cosmetic dental treatment cannot simply be "translated" to improvement in QoL or happiness.

A possible explanation for negative effects of cosmetic interventions on patient happiness and QoL is that patients' expectations prior to such interventions are high, so that if the results are disappointing, this may result in a drop in oral health-related QoL. This explanation for a lack of positive treatment result is consistent with the findings of a study among patients who had dental elements whitened, which found that 36% were dissatisfied with the final

result (McGrath et al., 2005). There is always a chance that the patients will eventually realize that their appearance is still imperfect, once again leading to painful feelings of dissatisfaction, resulting in a search for new ways to feel better or fulfill certain desires. This can easily lead to people getting stuck in a vicious cycle of dissatisfaction and the desire to fix their physical imperfections, creating a kind of addiction to cosmetic interventions rather than the desired happiness (see Fig. 8.1).

Another possible explanation for the decrease—rather than increase—in QoL following a cosmetic dental intervention, is that a visible change to dentition may be of relatively little value to an individual's well-being. Individual circumstances and stressful life events, such as divorce or loss of a loved one, doubtless have a greater impact on a person's well-being than a dental intervention. Conversely, there are indications that the quality of loving relationships and meaningful daily activities contributes more strongly to happiness than an attractive appearance (Diener & Seligman, 2002). Although this is hardly the most positive of messages for cosmetic dentistry, it is in agreement with other research. For example, a study among extremely anxious patients showed that QoL did not auto-

matically improve even following thorough restoration of fully deteriorated teeth (Vermaire, De Jongh, & Aartman, 2008). Furthermore, research among the Dutch population found that the combination of satisfaction with one's body and one's teeth could not even explain 10% of the variation present in satisfaction (Gresnigt-Bekker et al., 2008). These results leave little room for optimism about whether an intervention to improve dental appearance is capable of inducing positive, long-term changes in happiness and QoL.

Body Dysmorphic Disorder

Few people have such a desire to improve their own appearance that they are disgusted or extremely ashamed of what they look like. Yet, this does occur. Some people find themselves so repellant that they dare not leave the house, while the physical abnormality is so minor that concern about it is clearly excessive. Such individuals are likely to suffer from a psychiatric condition called body dysmorphic disorder, or BDD (Sarwer et al., 1998), which is estimated to have a prevalence of 2% in the Western population (Rief et al., 2006). In order to meet the criteria for this psychiatric condition, the person must be preoccupied with a certain aspect of his or her appearance, suffer significantly because of this, while the consulted doctor or an unbiased observer can see nothing noteworthy. Box 8.1 lists a number of questions that patients may be asked to determine whether the patient meets the diagnostic (DSM-IV-R) criteria for BDD (Diagnostic and Statistical Manual of Mental Disorders, American Psychiatric Association, 2000).

The listed preoccupations people with BDD have often relate to visible parts of the body, such as aspects of the face and head, including facial skin, ears, eyes, nose, chin, lips, jaw, mouth, or teeth. Typically, people with BDD are convinced they have drooping eyelids, flaking skin, that they are balding, that their teeth are not white enough. Others are worried about

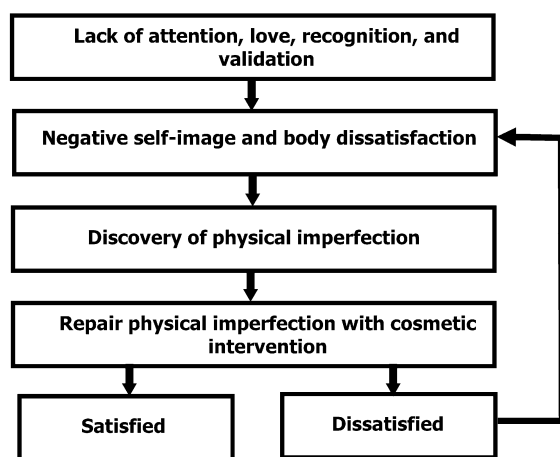


Fig. 8.1. How “addiction” to cosmetic interventions may be maintained.

Box 8.1. Questions that reflect the official criteria for BDD according to the DSM-IV-TR.

1. Are you very worried about your appearance in any way? (*or* Are you unhappy with how you look?) *If yes:* what is your concern?
2. Does this concern preoccupy you? That is, do you think about it a lot and wish you could worry about it less? How much time do you spend thinking about it?
3. What effect has this preoccupation with your appearance had on your life? Has it
 - significantly interfered with your social life, school work, job, other activities, or other aspects of your life?
 - caused you a lot of distress?
 - affected your family or friends?

other physical characteristics, believing them to be too big or too small, too fat or too thin, uneven or not symmetrical enough, too spotted, too dark or too light, uneven or are unsatisfied with the shape. However, frequently visible parts of the body are not always those that engender extreme worry. Examples include not only arms, legs, buttocks, or breasts, but also muscle mass or genitalia (Albertini & Phillips, 1999).

People with BDD do not suffer from more or less normal dissatisfaction. They describe themselves as ugly, repellent, or disgusting, and believe a certain body part is extremely unattractive, misshapen, or disgusting (Phillips, 2001). This chronic and disproportionate dissatisfaction is reflected by the amount of time people with BDD spend on their bodies. They can easily spend 3–8 hours per day thinking about their flaws, examining and looking at them in the mirror, store windows, or reflective surfaces, and attempting to hide or camouflage these perceived disfigurements (Phillips, 1996; Veale & Riley, 2001). For some, this may be

reason enough to avoid school, work, public places, or mirrors. Others expend huge amounts of effort hiding the body part perceived as ugly by investing a great deal of time and effort in applying makeup or wearing glasses, headscarves, or other concealing garments.

The degree to which this impacts a person's social functioning varies individually. Most people with BDD are capable of functioning socially, up to a certain level. They find ways to conceal their horrifying imperfections, for example, camouflaging makeup or using clothing to hide their imperfection. Others, however, barely dare to leave the house. In a study by Philips and colleagues among people with BDD, the authors found that 30% had not left the house in the week prior to the study (Philips et al., 1993). Their condition results in some people with BDD becoming severely socially isolated, developing depression, or even attempting suicide (Cororve & Gleaves, 2001). Unfortunately, BDD is often overlooked, as patients with this disorder rarely seek mental help themselves. As they are often so ashamed of the (perceived) defect, they are more likely to contact a plastic surgeon, dermatologist, orthodontist, or dentist to have the "defect" removed or changed (Phillips et al., 2001).

BDD in Dental Practice

Other than a few case studies of patients with BDD (e.g., Cunningham & Feinmann, 1998; De Jongh & Adair, 2004), surprisingly little research has been conducted into the prevalence of this condition in dental practice. This is notable because these individuals by definition have a strong tendency to report to dentists with a request for cosmetic dental interventions such as whitening, extensive facade work, and orthodontic treatments.

Only a few studies examined symptoms of BDD in relation to dental treatments (De Jongh et al., 2008, 2009). The first found that there are two significant predictors for the intention to undergo cosmetic treatments in the short term.

These are having an experience with cosmetic interventions in the past and having a preoccupation with a defect of appearance, the primary criterion for BDD. Another finding of this study was that people with such preoccupation were nine times more likely to consider tooth whitening, and six times more likely to consider orthodontic treatment than people without this characteristic BDD symptom. They were also five times more likely to be dissatisfied about their most recent treatment (De Jongh et al., 2008).

In a follow-up study, De Jongh et al. (2009) compared BDD symptoms in a sample of the Dutch population ($n = 878$) and people undergoing dental treatment at a cosmetic clinic ($n = 170$). The latter group was found to be significantly more convinced (9.5% vs. 5.5%) that they were unattractive, ugly, disfigured, or not attractive enough, despite the fact that others do not share this opinion. There were also measurable differences in the number of previous cosmetic interventions in general (16.5% vs. 5.9%) and dental procedures specifically (47.9% vs. 24.8%). Regarding the number of individuals meeting the criteria for a BDD diagnosis, the diagnosis was three times more common at the clinics than among sample from the general population (4.2% vs. 1.5%; see Fig. 8.2).

Is BDD a State of Mind?

Is there really something wrong with the appearance of BDD patients, or is it only perception? The results of a study by Jerome (1980) clarify this issue a great deal. He studied 20 patients on a waiting list for rhinoplasty. Patients meeting the main criterion for BDD were more dissatisfied with their own appearance than their healthy controls, while independent observers could not see any peculiarities. The investigator had all study subjects estimate the size and shape of their own nose. Patients with BDD symptoms were much better at this than a control group consisting of hospital staff. This finding seems to support the hypothesis that people who are dissatisfied with their body are right to do so. After all, they are particularly good at estimating the size or shape of the body part they are unhappy with, so they should be able to assess it realistically. This explanation is supported by results from a study by Stangier et al. (2008). These investigators manipulated certain esthetic aspects of photographs of other people's faces. These pictures were then assessed by three groups of test subjects: people with BDD, people with a disfiguring skin condition, and people with a healthy skin. The group of people with BDD scored significantly higher on

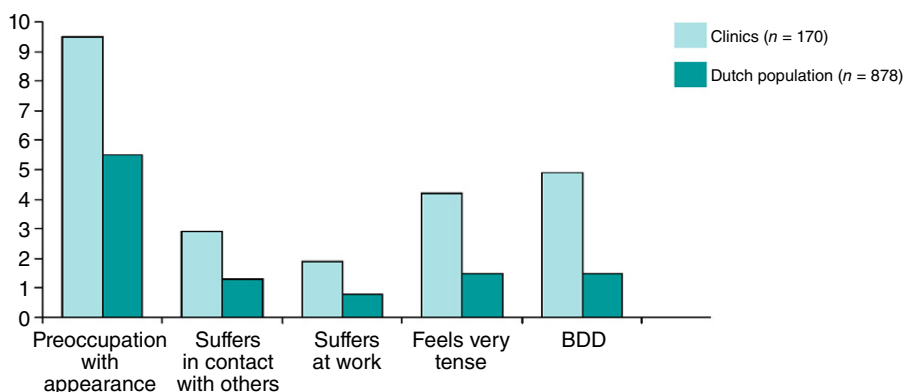


Fig. 8.2. BDD characteristics (%) among the Dutch general population versus people receiving treatment at a cosmetic dental clinic (De Jongh et al., 2009).

seeing created abnormalities in the photographs than the other two groups (Stangier et al., 2008). These findings suggest that BDD does not appear to be a problem with perception. People with BDD merely evaluate their own and others' appearance in an excessively precise and critical manner, leading to greater preoccupation with specific physical characteristics than people without BDD.

Psychological Assessment of Patients with Appearance Concerns

Dentists should be aware that being dissatisfied with one's own appearance is an important reason to seek cosmetic dental treatment. For this reason, the proportion of people with BDD symptoms seeking treatment in cosmetic dental clinics is relatively high compared to the general population. Patients with features of BDD seek cosmetic procedures as a means of alleviating their distress. That means that they may have a history of "shopping around." To this end, there is evidence to suggest that patients with characteristics of BDD are more likely to remain chronically dissatisfied about the results of any previous treatment. Therefore, the psychological assessment of individuals with characteristics of BDD should be an important part of the overall assessment. It serves to identify any potential problem at an early stage and may prevent patients with BDD features from being subjected to unnecessary and inappropriate treatments and iatrogenic harm. What follows are a number of topics that need to be addressed as part of the psychological assessment of patients with appearance concerns.

- A vital question is what the patient thinks is wrong. The answer to this question should help the clinician to decide whether there is a real deformity that needs to be treated.
- When a clinician is confronted with a patient with esthetic issues considering his jaw, his teeth, or other aspects of his appearance and the clinician cannot find any abnormalities,

he needs to take account of the patient's social background and psychological state. In such cases, the dentist should be aware of signs of possible underlying psychosocial factors that may either have triggered the patient's appearance concerns or prevent these from being resolved.

- One of the issues that the clinician needs to know is whether the patient is intrinsically (from the patient themselves) or extrinsically (from a desire to, for instance, please a spouse or a parent) motivated to seek treatment. A question that needs to be answered is why the patient has decided to seek treatment now; that is, what has precipitated this decision? To this end, the effects of any significant life event may be taken into account, such as a remark about his or her appearance, an acute crisis such as a divorce or any other chronically stressful circumstance. Although stress is a healthy physical reaction to certain events, if it is prolonged, it can exacerbate underlying psychiatric vulnerabilities and lead to both physical and mental problems. Accordingly, a general screening question would be whether there have been other things going on that have been stressful for the patient.
- It is important to maintain an appropriate degree of empathy and trust and not to compromise the patient–dentist relationship. Sensitive and careful questioning is important when eliciting relevant information as patients are frequently reluctant to discuss these issues. In most cases, this need not be wide-ranging or time-consuming, but can be targeted from answers derived from open-ended questions early in the assessment (see Box 8.1).
- Screening instruments can aid in deciding whether or not to accede to the patient's demands, such as the one developed by Cunningham and Feinmann, originally designed as a screening tool for patients prior to orthognathic surgery (Cunningham & Feinmann, 1998). A modified version is given in Table 8.2. The more answers from the right column apply to the patient, the more it is wise to consider not treating.

Table 8.2 Assessment Criteria That Can Be Used to Help with the Assessment of Patients and the Possible Presence of Characteristics of BDD

Assessment indicators	Positive	Negative
Defect		
• Is a defect or abnormality present?	Yes	No
• Is the defect minor?	No	Yes
Help request		
• Is the help request odd, vague, or otherwise unclear?	No	Yes
• Is the requested treatment possible and feasible?	Yes	No
• Is there a history of dissatisfaction with previous interventions?	No	Yes
• Is there a history of “shopping around”?	No	Yes
• Has the requested treatment been considered properly?	Yes	No
• Was treatment (primarily) instigated due to pressure from others?	No	Yes
Expectations		
• Are expectations regarding treatment results reasonable and realistic?	Yes	No
Background and psychological state		
• Does the patient currently suffer from a very negative self-image, psychological complaints, or a form of emotional crisis?	No	Yes
• Does the patient have a history of (or been treated for) psychological problems?	No	Yes
• Does the patient tend to respond negatively or excessively to certain life events?	No	Yes
• Does the patient have a network of friends and family that supports him/her?	Yes	No

How Can Dentists Avoid Going Too Far in Improving Someone's Appearance? Some Practical Guidelines and Helpful Tip

As stated earlier, it is important to remain vigilant and practice restraint with patients with unusual esthetic requests as people can easily become trapped in the cycle outlined in Figure 8.1 without being aware of it. That cosmetic treatment or removal of physical imperfections is not without risks is demonstrated in a study by Phillips et al. (2001). They found that in almost 80% of adults with BDD undergoing cosmetic treatment for their “defect,” BDD symptoms remained the same or even worsened (Phillips et al., 2001). This may apply to an even greater degree to settings where people present with or request referrals for irreversible surgical interventions, such as orthognathic surgery.

- It is important to be firm with those who are impatient and demanding and are desperate to start quickly. The dentist should take the time to identify and to calmly explain the discrepancy between what he observes and what the patient sees. The best thing he can do is to reassure the patient and explain that he does not wish to perform a treatment for which there is no dental necessity for. Another tip is to motivate the patient to seek reassurance regarding the severity of the perceived physical flaw by checking his or her beliefs against the opinions of important individuals in his or her social environment. Do others (e.g., spouse, children, friends) also believe the patient to be disfigured? Do others even notice? What if the physical flaw is a result of excessive worry or an overly critical viewpoint? In such cases, the decision to treat and sacrifice healthy tissue would be wrong, unjustified, unnecessary, and potentially

harmful. A period of watchful waiting may not only test the real motives for their treatment request but allows an acute crisis to pass or to be solved otherwise.

- The challenge of the clinician is to prevent people with characteristics of BDD from obtaining the desired dental treatment and changing their minds. However, they often will not see much in an approach to addressing their problems that does not involve repairing their defect. Yet, the basic premise is that, on the one hand, the dentist cannot force the patient to undergo a certain treatment by the dentist, but, on the other, the patient cannot force the dentist to carry out a treatment that is not within the bounds of accepted treatment or that is contrary to the ethical principle of “nonmaleficence.” This term refers to the notion that it is better not to do something, or even to do nothing, than to risk causing more harm than good. Thus, when faced with a request for, for example, an extraction, the dentist should express empathy for the patient’s particular needs or wishes, and explain why he or she nevertheless cannot meet this request intervention that carries an obvious risk of harm but a less certain chance of benefit. Next, the dentist works with the patient to devise an alternative treatment plan that is within the bounds of accepted treatment, and is objectively beneficial—yet also subjectively acceptable—to the patient. It should be noted that also when such a different and mutually agreeable treatment plan cannot be devised, dentists are not obligated to perform a treatment that would breach the standard of care and generally should refuse to do so. This is because treating someone who is overly worried, whether about the appearance of the oral area or another area, never lies within the dentist’s area of expertise. Giving in to the request for treatments without dental necessity would go against professional standards and is therefore considered unethical (Broers, Brands, & De Jongh, 2010).

- If the patient suffers unduly from his or her perceived physical flaw, and nobody else sees it that way, combating emotional pain is the obvious choice. Patients can only, or at least primarily, be motivated by addressing their complaint. What the dentist can do is to undermine patients to undergo the desired intervention while at the same time motivating them to seek out a solution for the problems relating to BDD in a different area. This makes it clear that it is wise to screen for signs of BDD prior to initiating treatment, so that patients may be referred for adequate treatment to an expert care provider: a clinical psychologist or psychiatrist, preferably someone with experience in treating BDD. Options include cognitive behavioral therapy or other intervention methods, psychopharmacological medication (selective serotonin reuptake inhibitors, SSRI), or a combination thereof (Brown, McGoldrick, & Buchanan, 1997; Cororve & Gleaves, 2001; National Institute for Health and Clinical Excellence, 2005).

Summary

Plastic surgery and cosmetic interventions are all the rage, and centers for cosmetic treatment are popping up everywhere. Dentists also want to address patient needs and questions. However, empirical research has revealed indications that QoL does not improve for patients following cosmetic treatment. On the contrary, there are indications that oral health-related QoL is likely to decrease rather than to increase, following cosmetic dental treatment. The desire to make changes to appearance could be a symptom of an extremely negative self-image or a psychiatric condition called BDD. Sufferers from this condition are excessively preoccupied with a mild, imagined physical flaw. Restraint is called for when considering extensive cosmetic procedures in individuals with symptoms and perceived physical imperfections. This chapter provided a number of tips on how to do so.

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Chronic Orofacial Pain: Biobehavioral Perspectives

Samuel F. Dworkin and Richard Ohrbach

Key points

- Defining pain: An unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage.
- Biobehavioral perspectives on TMD: The most important chronic orofacial pain conditions dentists encounter.
- A biopsychosocial model for understanding chronic pain and its management
- The dentist as a biobehavioral clinician, applying a dual-axis approach to assess and manage the physical (Axis I) and emotional, behavioral, and psychosocial (Axis II) components of chronic orofacial pain.

Overview

Chronic pain in the masticatory muscles of the face and the temporomandibular joints, most commonly referred to as temporomandibular disorders (TMDs), but also known as temporomandibular joint disorder (TMJD), and historically by the less appropriate term, temporomandibular joint (TMJ), are by far the most prevalent of all chronic orofacial pain conditions. TMDs comprise a cluster of related chronic pain conditions that affect the hard and soft structures of the orofacial region characterized principally by (1) the presence of pain typically in the preauricular area in front of the ear, the cheeks, and/or temporal area; (2) limitations in movement of the mandible; and (3) joint sounds detected in the TMJ during functional excursions of the jaw.

TMD arises in an orofacial region which houses highly specialized organs of special sense, notably taste, smell, and hearing. In addition, dentistry is of course most familiar with the specialized structures of the oral cavity, especially the teeth, periodontium, oral mucosa, salivary glands, and tongue. Not surprisingly, this relatively compact anatomical region is not only highly vascularized but is further characterized by an especially complex network of central and autonomic nervous system pathways, including, especially, the second and third divisions of the trigeminal nerve. The craniofacial and perioral structures involved in TMD—the bones of the upper and lower jaw and the surrounding musculature—function as a stomatognathic system which is responsible for several life-sustaining physiologic processes, including eating, breathing, swallowing, and verbal as well as nonverbal communication. Inevitably, these physiologic processes are also associated with psychological and psychosocial functions of tremendous significance to the individual—functions that underlie the development of singularly unique intrapersonal and psychosocial characteristics distinguishing one person from another—and which affect how we look and how we express our meanings and our emotions.

Within this complex orofacial region, TMD emerges as a common chronic pain disorder, third in prevalence among common chronic pain problems according to the best available evidence, after low back pain and chronic headache. TMD is most prevalent in women during the reproductive years and falls off sharply with advancing middle age. It definitely appears in adolescence but is rare in older men. All epidemiologic studies of TMD report similar patterns (Drangsholt & LeResche, 1999). Other than the age and gender factors just mentioned, knowledge regarding other risk factors in adults for first-onset TMD are only just emerging and point to a complex intersection among clinical, health status, psychological, psychophysical, and genetic variables (Fillingim et al., 2013; Greenspan et al., 2013; Ohrbach et al., 2013; Sanders et al., 2013; Smith et al., forthcoming). Factors associated with the transition from acute pain to chronic pain are as yet unidentified.

While any one of the three major clinical indicators of TMD (i.e., pain, limitations in jaw opening, and joint noises) is estimated to be present in 5–50% of the population at any one time, treatment seeking seems only poorly correlated with the presence of TMD signs and symptoms other than pain. Intensity of TMD-related pain is the most reliable predictor of treatment seeking, and pain relief is the most important single criterion by which patients and clinicians alike judge the success of clinical treatment.

The scientific rationale for including TMD among important clinical chronic conditions rests on confirmed observations from scientific studies as well as abundant clinical experience that maladaptive overt behaviors, psychological status, and psychosocial functioning can all be impacted by persistent TMD-related pain. Chronic pain arising in conjunction with impairment of the masticatory system from whatever etiology impacts the lives of TMD pain sufferers—from mild alterations in eating behaviors to profoundly disabling depression and appreciable interference with activities of daily living. Indeed, all chronic pain conditions

share features in common from the psychosocial domain (e.g., depression, limitations in activities, increased healthcare utilization), while each chronic pain subtype retains unique physical features from the biologic (or physical) domain related to specific body site (e.g., headache, back pain) or specific pathophysiologic processes (e.g., postherpetic neuralgia, cancer).

Chronic orofacial pain is always an organismic response, not simply a local phenomenon, because it always involves simultaneous processing of diverse types of information at different levels of integration. Pain is not a passive consequence of the transfer of a defined peripheral input, from say the masseter muscle, to only one center in the cortex. Thus, pain is an active process generated partly in the periphery and partly within the CNS. The available evidence suggests that the peripheral source of pain may be not only nociception, but it can also be based solely on nonnociceptive sensation which is thought to trigger CNS events that give rise directly to "pain." Multiple plastic changes, of which the brain is especially capable of, result in, among other things, learning and memory and consequently determine the gain of the system (Woolf, 2007). The International Association for the Study of Pain (IASP) (Merskey & Bogduk, 1994) gold standard for the definition of pain and associated terms serves to reinforce this understanding:

Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage (p. 210). The IASP definition is further amplified (p. 210), as follows: Pain is unquestionably a sensation in a part or parts of the body . . . pain is always unpleasant and therefore, also an emotional experience . . . pain is always subjective and results from co-occurring factors including pathobiology, prior experience and social context.

Over the past six decades, tremendous advances have been made in identifying struc-

tures and processes—both physiologic and behavioral—which contribute to chronic pain phenomenology. These advances into domains either previously not even known to exist or not suspected of being implicated in the pain experience have been nothing less than breathtaking for the elegance of the science and the complexity of the phenomenology they reveal. Basic and transitional dental scientists as well as clinical dental researchers have made significant contributions to the overall advancement of our knowledge about pain, including chronic orofacial pain. Nevertheless, chronic TMD remains enigmatic, and in some quarters, highly controversial especially with regard to both unsubstantiated etiologic theories and unproven claims of treatment effectiveness.

In any event, it is entirely reasonable to maintain that TMD pains arise, fluctuate, persist, remit, and have the potential to be debilitating. Responsible scientists and clinicians, meanwhile, remain unable to integrate the diverse anatomic, physiologic, and psychological data manifest in patient presentations into an etiologically based diagnostic system. Presently available diagnostic systems, such as the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) and its recent successor, the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD), later discussed more fully, are based largely on reliable symptom descriptions and clinical examinations of presenting signs and symptoms.

The purpose of this chapter is to present current perspectives on assessment and treatment of chronic orofacial pain patients. These perspectives advocate understanding the chronic pain patient as an integration of objectively measured physical and pathologic findings with subjectively reported physical, psychological, and psychosocial conditions. The universally accepted model system for understanding chronic pain from these perspectives is labeled the *biopsychosocial* model for pain (Engel, 1977). Accordingly, the specific objectives of this chapter are to (1) define chronic pain and the most common chronic

orofacial pain conditions confronting dentistry; (2) provide the rationale and description for the biopsychosocial model as applied to chronic orofacial pain; and (3) describe the role of the dentist as a biobehavioral clinician. In the context of this chapter, the clinical responsibilities of the dentist as a biobehavioral clinician extend to assessing the biobehavioral dimensions of chronic orofacial pain, which include psychological, psychosocial, and physical/pathologic assessments, and to integrating such biobehavioral assessment into evidence-based clinical decisions regarding the comprehensive management of the chronic orofacial pain patient.

Introduction

The most prevalent chronic orofacial pain conditions are musculoskeletal (e.g., TMD) and neuropathic (e.g., trigeminal neuralgia and atypical odontalgias) (LeResche, 2000). As a healthcare profession, dentistry is arguably unparalleled in reducing and eliminating acute pain (e.g., toothache, dento-alveolar, or periodontal abscess). However, chronic orofacial pain remains, unfortunately for too many patients, more resistant to quick or simple resolution because the amount and even the location of pain experienced and the behaviors of the patient with chronic or persistent pain problems are only poorly related to physical events, making etiology elusive and treatment difficult. Atypical odontalgia, for example, is usually associated with poorly defined pathologic markers inconsistent with expressed pain perception and behavior. Similarly, persistent pain in the masticatory muscles (myalgia) can be a source of minor inconvenience to some patients and for others can become a decades-long major disorganizing force associated with significant depression and disruption of their everyday lives—yet there may be no detectable, let alone diagnosable, physical change to distinguish the condition in these individuals. So,

whether persistent pain is experienced as a minor inconvenience or as a source of major life disruption, chronic orofacial pain and related disability often cannot be understood in terms of diagnosable pathology (Dworkin, 1994).

Musculoskeletal pain, particularly TMD-related pain, is overwhelmingly the most commonly occurring chronic orofacial pain confronting dentistry, with a prevalence of about 10–15% in the United States and around the world (LeResche, 2000). TMD is associated with the same significant psychological and psychosocial issues that are found in all chronic pain conditions, orofacial or otherwise (Von Korff et al., 1988); much of the remainder of this chapter uses TMD-related pain to elucidate major concepts (see Suvinen et al., 2005, for a comprehensive review) as well as methods for biobehavioral assessment and management.

Toward a Biopsychosocial Model for Chronic Orofacial Pain

Newly emerging fields of brain-behavior neuroscience—including the use of functional MRI and other brain-imaging modalities to visualize brain responses in real time—and the rapidly emerging field of epigenetics—demonstrating how the environment influences gene expression—has provided new insights into the biologic basis for subjective experience. From these exciting new fields emerges a science-based rationale for understanding how emotional, cognitive, and behavioral processes can become linked and stored as integrated neural circuits, or neuromatrices, preserving memories and belief systems which influence, among other things, our subjective pain experience and how we come to the behaviors we take to cope with pain.

These complex biologic interactions reflecting the multiple dimensions of pain are understood to be under the influence of such objective biologic factors as, for example, genes (Mogil, Seltzer, & Devor, 2004) and reproductive hormonal factors (LeResche et al., 1997). Each indi-

vidual learns about pain through experiences related to injury in early life. Biologists recognize that those stimuli which cause pain are liable to damage tissue. Accordingly, pain is always a subjective experience we associate with actual or potential tissue damage (Merskey & Bogduk, 1994). It is unquestionably a sensation in a part or parts of the body, but it is also always unpleasant and therefore also an emotional experience. Alternatively, activity induced in the nociceptor and nociceptive pathways by a noxious stimulus, in the absence of the subjective self-report of the aversive experience, is not pain. In fact, finding neural activity in nociceptors and pathways known to conduct painful impulse is referred to specifically as *nociception* (but not *pain*), in contrast to *pain* which is, as the IASP definition so clearly states, a subjective experience.

Conversely, patients often report pain in the absence of detectable tissue damage or pathophysiological cause. Such subjective pain reports are always best presumed an accurate reflection of the patient's experience even if the dentist cannot find an objective biologic explanation for the pain symptom. It has been historically the case that pain symptoms not accompanied by a detectable physical basis for the pain have, unfortunately, led well-meaning clinical practitioners—both dentists and physicians—to attribute the pain report to psychological rather than organic etiology, implying that somehow the pain is imagined, hence, not “real.” We find such an approach of little practical value for chronic pain because there is usually no way to distinguish the physical but undetected (and perhaps undetectable) cause, versus higher-order brain mechanisms that clearly are able to allow pain to be experienced in the clear absence of any physical basis (e.g., phantom limb pain, where pain is reported in a limb which has been amputated). If the patient regards their experience as pain and reports it in the same way as pain caused by tissue damage, it should be accepted as pain and treated accordingly. This definition avoids

tying pain exclusively to an identifiable peripheral stimulus and avoids the potential pitfall of attributing a patient's subjective report as reflective of either real or imagined pain. Instead, a more useful (and far more palatable for patients) view is that pain report in the absence of discernible tissue damage can potentially arise from *multiple reasons* (e.g., physical, psychological, social, and/or cultural processes) that invoke physiologic activity that can be experienced subjectively as pain.

The Biopsychosocial Model

Mechanistic, biomedical views of pain as originating in the body and arising or maintained solely from objectively measurable pathophysiology are now considered scientifically inadequate to fully explain a chronic pain patient's presentation. It is now understood that health-care providers have an inherent need (if not ethical mandate) to rely on the patient as the only reliable source for knowing whether or not pain is present. We simultaneously recognize that the subjective pain report is the result of many co-occurring factors, ranging from pathobiology to prior experience to social context. Hence, the biomedical model of pain has been outgrown because of its too exclusive emphasis on physical factors and observable tissue damage. The biomedical model of pain has been succeeded by a biopsychosocial model system (discussed more fully in a later discussion) which clarifies how physical events in the body or in the environment often can give rise to not readily predicted pain experiences and behaviors that can be dependably shown to be related to patients' past pain history, gender, ethnicity, and, most critical for dentistry, factors in the environment which are equated with pain or the potential for pain. The term biopsychosocial has been applied to the most widely used model system developed to capture how information processing of painful events implicates psychological, behavioral, and psychoso-

cial factors that interact with the physical events. The resultant of this complex interactive process is the wide range of pain expression which dentists struggle to incorporate into their overall approach to management of dental and orofacial pain.

Figure 9.1 presents, in schematic form, a model for integrating presumed physiologic activity associated with ongoing pain experience. The model depicts that successively higher levels of central processing by the brain integrate the nociceptive or harmful stimuli present in the pain transmission system and underlie the emergence in consciousness as pain. Higher-order central processing assigns meaning to the pain for each individual, which then mobilizes patients to act in response to their uniquely defined pain state and within the social context of permissible behaviors. Because the model system seeks to integrate physiologic or pathophysiologic activity with associated psychological states and socially and culturally determined behavior, the model is labeled a *bio-psycho-social*

model—that is, a model integrating biologic, psychologic, and social components of the pain experience (Dworkin, Von Korff, & LeResche, 1992).

The stages of the pain experience offered by this model system all reflect normal coping mechanisms by which individuals come to experience pain and then attempt to make sense of the pain and adapt appropriately. These same higher-order processes are subject to distortions and maladaptive responses as well, and some examples are given for each level at which it is possible to analyze complex expressions of pain using this biopsychosocial model:

- *Nociception*: Physiologic events associated with actual or potential tissue damage that, among other things, provides information via the pain transmission system sensory information to higher centers dealing with attention, memory, emotions, decision-making, and motor preparedness.

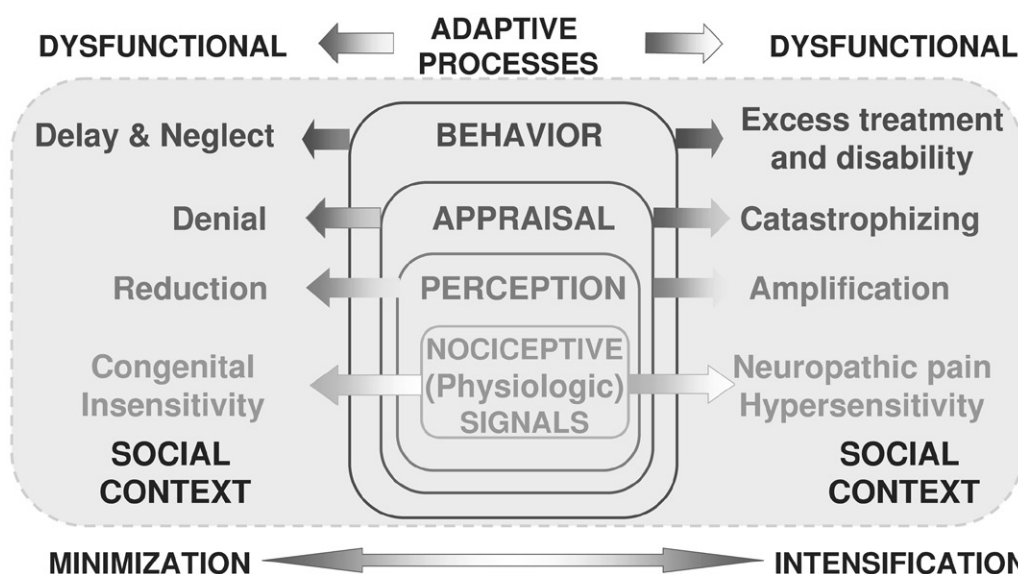


Fig. 9.1. Biopsychosocial model for pain. The model's five-stage processes integrate physiologic or pathophysiologic activity with associated psychological states and socially and culturally determined behavior.

- *Perception*: The initial stage of forming a subjective pain response, self-identifying the *physical* qualities of the pain experience, which include *sensory* (e.g., sharp, dull, throbbing), *spatial* (e.g., highly localized to an specific anatomic site, as in acute toothache, or diffuse, as in many cases of TMD pain), and *temporal* (e.g., acutely arising, recent onset, as in toothache, or recurrent and persistent over time, as in chronic TMD pain qualities)
 - *Appraisal*: Higher-order integrative mental operations attaching cognitive and emotional meaning to the painful sensations being perceived. The appraisal level is crucial for attaching attitudes, beliefs, expectations, and emotional arousal to those pain sensations—in a word, meaning is attributed to the physical experience. Inappropriate attribution of meaning, influenced by interaction of nociceptive activity with attention and memory, may yield cognitive processes and emotional states which present as pain-related catastrophizing thoughts, fear, anxiety, or depression.
 - *Behavior*: Observable pain behaviors that are either contributory (e.g., bruxism) or the result of pain (verbal and nonverbal expressions of pain, inactivity, diet modification). Fordyce's introduction of the notion of 'chronic pain behavior' into the rehabilitation of chronic pain patients was a revolutionary concept that called attention to the possibility for chronic pain conditions to become associated with maladaptive behavioral patterns of work or social avoidance (Fordyce, 1976). The implication of this notion is that chronic pain treatment should not focus exclusively on uncovering difficult-to-observe pathophysiology but should focus heavily on behaviorally based methods for returning the pain patient to a more productive lifestyle. In more recent years, many of Fordyce's seminal concepts, clearly anchored in reinforcement models associated with learning theory, have reemerged in the fear-avoidance model (Vlaeyen & Linton, 2000). The fear-avoidance model—sometimes called the fear of (re) injury model—is relevant to musculoskeletal pain in particular, and it indicates that dysfunctional beliefs regarding the nature of an injury or a pain experience lead to behavioral adaptations in the individual's behavior which ultimately lead to an increasingly more restricted scope of behavioral range (e.g., avoiding use of the jaw for anything other than talking through clenched teeth) and deconditioning, such that any attempt at normal use immediately results in sensations perceived as more disabling pain and identified by the individual as evidence of further tissue damage. One of the salient characteristics of the fear-avoidance model is that it well explains a series of events, from tissue damage to ostensible healing accompanied by persistent pain; incorporates depression and disability; and leads to behaviorally oriented therapies.
 - *Sick Role*: Cultural and societal factors shape the pain experience by defining roles for pain patients that may sanction disability as well as lead to specific forms of pain-related health care and medications. Sanctioning of different sick roles for men and women in response to pain is an important example of the influence that social factors can play in determining observable manifestations of pain. Options for treatment of dental and orofacial pain are often constrained by factors dictated by social or cultural factors, such as availability of health insurance and governmental regulation of narcotic analgesics. However, the sick role for a significant minority of patients experiencing chronic pain is associated with heavy use of healthcare services and demand for narcotic pain medications, both examples of pain behaviors that can run counter to social norms in many parts of the world. Conversely, a patient may inappropriately reject the sick role and consequently avoid treatment that could be beneficial.
- In summary, the biopsychosocial model, as its name implies, reflects our growing

understanding that illnesses and cures are indeed complex. In order to understand how and when we experience pain and to understand whether or not we will respond to treatment, a host of factors in addition to biology must be considered. The biopsychosocial model does not seek to compete with, let alone replace, scientifically derived biologic models or current clinical practices. Rather, the model is an integrative one, which conceives that biologic processes and environmental factors, in the broad sense defined earlier, are equipotent for explaining not only pain conditions but also responses to treatment for the alleviation of pain. Moreover, the model indicates that the provider must start from a view of inclusiveness before assigning relative weights to the potential contributions of the identified factors within each of the bio, psycho, and social realms.

A Dual-Axis Approach to Assessment of Dental and Orofacial Pain

From the previous discussion, it is not surprising to find that currently no known chronic pain problem is conceived of as either solely physical or mental, biologic or psychological—either in the body, hence “real,” or in the mind, hence “imagined.” Instead of trying to force a particular patient with pain onto one end or the other of a single psychological-versus-somatic continuum, the biopsychosocial perspective suggests as an alternative, as Figure 2.2 depicts, that at least two axes be conceptualized for characterizing patients in pain; that is, that each patient be located on: Axis 1, reflecting the status of physical/clinical factors that may yield a biologically based diagnosis, and Axis 2, reflecting psychological, emotional, behavioral, and psychosocial status.

The Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) (Dworkin & LeResche, 1992) was the first attempt in the field of chronic pain to provide clinical researchers and clinicians with an

evidence-based method for diagnosing the most common subtypes of TMD while simultaneously allowing classification of the TMD patient’s pain experience, jaw behavior, psychological status and level of everyday psychosocial functioning. As the name implies, the RDC/TMD was initially offered to the research community for investigation of its reliability and validity with the expectation that accumulation of scientific data would allow the RDC/TMD to be modified and evolve into an evidence-based diagnostic and classification system validated for use by dental and medical clinicians treating TMD patients. Indeed, this programmatic plan for the evolution of RDC/TMD from a research tool to a clinically useful diagnostic system has recently been accomplished and, again, representing a first in the field of chronic pain through the development of the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD; Schiffman et al., forthcoming) as the next iteration of the RDC/TMD into a more reliable and valid clinical and research tool. A multisite study (RDC/TMD Validation Project) was funded by NIDCR in order to test the reliability and validity of both Axis I and Axis II of the RDC/TMD, given its importance for systematic scientific research and potential for clinical utility. The longer-term goal of the Validation Project was to evolve evidence-based criteria for both physical diagnosis and the assessment of the biobehavioral dimension of pain. The outcome of this major research project was the first revision of the RDC/TMD, which offered significant evidence-based changes in both Axis I diagnoses and Axis II assessment methods for classifying the behavioral and psychosocial status of TMD patients in a clinically useful manner. Figure 9.2 schematically depicts how the integration of Axis I and Axis II has the potential for allowing a more comprehensive understanding the TMD patient. However, for present purposes, only the Axis II component will be further elaborated on in this chapter.

The RDC/TMD, not surprisingly, is based on the dual-axis approach outlined earlier for the diagnosis and assessment of TMD patients, and

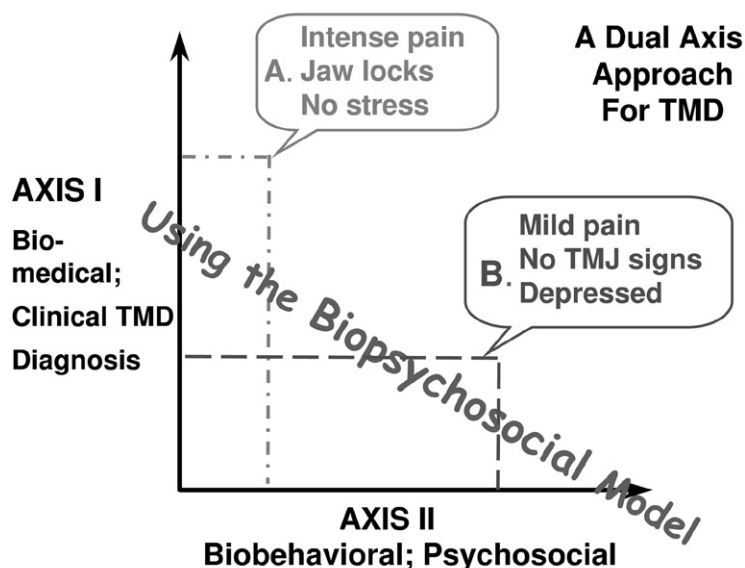


Fig. 9.2. Dual-axis schematic for pain assessment. Axis I comprises the status of a patient's physical/clinical factors that may yield a biologically based diagnosis; Axis II comprises an assessment of the patient's psychological, emotional, and behavioral status.

the DC/TMD has maintained that structure. As the recommendations from the International Consensus Workshop highlight (Ohrbach et al., 2010a), research over the last decade has lent support to both the Axis I (physical) and Axis II (psychosocial) components of TMD assessment. The Axis II components are reliable and valid as screening measures for depression, nonspecific physical symptoms, and psychosocial disability (Ohrbach et al., 2010b); these measures are freely available at the website of the International Consortium for TMD Research (<http://www.rdc-tmdinternational.org>). Building on the RDC/TMD Axis II, the constructs retained in the DC/TMD include depression, nonspecific physical symptoms, and psychosocial disability. In addition, functional limitation, as a specific index of the behavioral consequences of having a jaw problem, was originally implemented in the RDC/TMD as a nonvalidated checklist but has emerged as a fully validated

instrument (Ohrbach et al., 2008a; Ohrbach, Larsson, & List, 2008b), appropriate for use in a wide context of dental diseases. Complementing the core of constructs envisioned in the RDC/TMD are anxiety, pain locations, and oral parafunction. Table 9.1 lists the measures associated with each construct according to the RDC/TMD and now the DC/TMD. The discussion that follows describes the RDC/TMD approach to Axis II assessment, interwoven with the newer DC/TMD Axis II, which should eventually replace it based on its newer scientific evidence.

Assessing Psychological and Psychosocial Factors

As a guide to assessing pain patients with regard to the contribution of Axis 2 psychological and psychosocial factors, four domains of such biobehavioral assessment are recom-

Table 9.1 Recommended Measures for Core Biobehavioral Constructs Associated with Temporomandibular Disorders

Construct	Measure		Explanation for DC/TMD implementation
	RDC/TMD	DC/TMD	
Depression	SCL90 depression scale + vegetative symptoms scale	PHQ-9	Nonproprietary, shorter, available in many languages
Nonspecific physical symptoms	SCL90 somatization	PHQ-15	Nonproprietary
Psychosocial disability due to pain	Graded Chronic Pain Scale	Graded Chronic Pain Scale	Existing instrument is most concise of its kind
Jaw limitation	Ad hoc checklist	Jaw Functional Limitation Scale	RDC/TMD checklist lead to development of the replacement instrument
Anxiety	N/A	GAD-7	Nonproprietary
Parafunction	2 single items	Oral Behaviors Checklist	Not yet fully validated, but uniquely assesses the target behaviors
Pain locations	N/A	Pain drawing	Analog depictions are excellent for clinical settings, but checklist approach is generally preferred in research setting
Distress screener	N/A	PHQ-4	For use in settings where brief screening is the only goal

mended: (1) pain history and response to prior treatment; (2) parafunctional oral behaviors (e.g., assessment of bruxism, pernicious oral habits); (3) psychological screening; and (4) interference with usual physical and psychosocial functioning. From a practical treatment perspective, it should be noted that the assessment of these biobehavioral domains is possible largely through routine history and examination methods, supplemented with reliable and valid measures that are relatively easy for dentists to use and interpret.

Pain and Treatment History

Pain and treatment history are typically gathered as part of any new dental patient assessment. It is now strongly recommended that dentists gather data on intensity of pain through the use of visual analog or 0–10 verbal numeric scales; in the former, patients simply mark a

10 cm. line that is anchored at one end with “no pain at all” and the other end with a severe anchor such as “the most intense pain imaginable” or, in the latter, respond to a verbal question using the same anchors for the numerals 0–10. Such scales are used to assess average or typical pain intensity, worst pain intensity, and current pain intensity, and collectively, these three temporal dimensions contribute to a measure, Characteristic Pain Intensity, which has excellent reliability and validity (Ohrbach et al., 2008b). In addition to pain intensity, the spatial dimension of pain is easily assessed with a pain drawing, and the clinician (and researcher) can readily assess not only patterns of pain spread (suggesting central sensitization) but also presence of other pain disorders such as back pain, irritable bowel syndrome, or widespread pain, wherein pain affects multiple parts of the body. The presence of other pain condi-

tions suggests further complications for the individual related to central dysregulation. With regard to treatment history, it is important to record extent of prior treatment for chronic pain and degree of success or failure of such past treatments. Repeated bouts of treatment failure often reflect high risk for the failure of the next treatment.

Parafunctional Jaw Behaviors

The RDC/TMD includes two single items for assessing potentially excessive jaw behaviors of clenching and sleep grinding (bruxism) of the jaws. These behaviors have historically been viewed as a significant risk factor by many for the initiation and maintenance of TMD-related orofacial chronic pain, despite no clear scientific evidence to confirm the etiologic role that jaw parafunctional behaviors may play. Sleeping behaviors (i.e., sleep bruxism) continue to be regarded in clinical settings as clearly related to jaw pain, resulting in mechanical treatments despite evidence that the treatments themselves do not have high theoretical specificity for the disorder (Truelove et al., 2006). In research settings, sleep bruxism is viewed quite skeptically for its causal role in TMD pain (Lobbezoo & Lavigne, 1997; Raphael et al., 2012). More recent research (Glaros, Williams, & Lausten, 2005), however, has demonstrated causal roles for such waking behaviors to be associated with state-increases in pain, and oral parafunctional behaviors, as assessed with the Oral Behaviors Checklist, occur at a high rate in TMD patients (Ohrbach et al., 2011), wherein the authors questioned whether the behavior was causal, respondent, or a mixture of relationships, as based on the quite wide confidence intervals associated with the odds ratio. More recent data from that same project, however, indicate that oral behaviors do appear to have clearly causal contribution to the development of first-onset TMD pain (Ohrbach et al., 2013). This measure and others in widespread (Stegenga et al., 1993) use are straightforward and easy for dentists to use, interpret and incorporate into their routine history protocols.

Psychological Status

Screening assessment for depression, anxiety, and multiple nonspecific physical symptoms, referred to in psychiatry as somatization, is recommended. Formal assessment of psychological status requires specialized measurement instruments and/or diagnostic interview schedules and is beyond the training and expected clinical expertise of most dentists. However, the inclusion of relatively straightforward measures such as the SCL-90 (Derogatis & Cleary, 1977; Derogatis, 1983), as used as the foundation for the RDC/TMD measures of depression and somatization, in a clinical data base, minimizes resistance to the perception that attention is being unduly given to psychological factors when the patient feels that a physical pain problem is being presented if used routinely with all patients.

The DC/TMD replaced the SCL-90-based measures within the RDC/TMD with corresponding measures for depression and physical symptoms that had emerged from the well-known PRIME-MD project (Spitzer, Kroenke, & Williams, 1999) on the basis of equally good reliability, provision of translations already performed for use in international settings, and better utility due to such measures being adopted in medical (vs. psychiatric) research. In addition, anxiety was added as a construct that should be measured. These types of measures, although representing well-established psychological tests with excellent reliability and validity, are appropriate only as screening aids for psychological disturbance. As emphasized in the RDC/TMD and DC/TMD Axis II, these psychological measures are not intended to be diagnostic of psychopathology, but rather to allow dentists treating chronic orofacial pain patients to obtain a clearer understanding of the psychological status of the chronic pain patient in order to evaluate if there is either a need for more specialized psychological assessment or, whether the dentist is likely to be able to formulate a treatment plan which has a reasonable chance of succeeding because it is appropriate to the state of the person as well as the state of

the organ system in which physical pathology is presumed to reside.

Anxiety and panic are emotional disturbances seen not only in phobic dental patients but are increasingly recognized as concomitant psychological factors of chronic orofacial pain as well. These states are commonly seen during the acute phase of the orofacial pain problem when uncertainty over the meaning and future course of pain and any physical disease or other pathology that might underlie the pain is a dominant concern. Often as the pain becomes more chronic, depression becomes a more prevalent co-occurring problem as fear and anxiety give way to hopelessness about the future and helplessness about finding a cure.

Similarly, the subjective reporting of widespread, nonspecific physical symptoms (sometimes inappropriately labeled (somatization) is present to an excessive degree in a significant minority of TMD patients, and is associated with such diverse consequences as representing an important risk factor for poor TMD treatment outcome and for potentially confounding the accurate diagnosis of particular chronic orofacial pain conditions (McCreary et al., 1992). Recent research has increasingly paid attention to the prevalence and significance of multiple unexplained medical symptoms as observed in chronic pain patients (Rief & Broadbent, 2007), lending another dimension to physical symptom reporting. As a result, the RDC/TMD Axis II scale to assess nonspecific physical symptoms was replaced by an even more relevant scale (see Table 9.1) that avoids any reference to the term "somatization" which for some still carries an historical but unsubstantiated association with "neurotic" symptoms. The presence of these psychological disturbances can be assessed with items found in the DC/TMD listed in Table 9.1.

Physical and Psychosocial Status

While the RDC/TMD Axis II included an ad hoc checklist for assessment of functional limitation, recent research has resulted in a formal

instrument for the measurement of this construct via the Jaw Functional Limitation Scale (JFLS; Ohrbach et al., 2008b). The JFLS assesses the constructs of limitation in mastication, limitation in jaw mobility, and limitation in emotional and verbal communication. A short-form (8 items) is available that provides only a global measure. The meaningfulness of these constructs is clear for dentistry as a whole, but the utility of measuring these constructs has yet to appear due to the relative newness of this instrument within the published literature. Observed data describing jaw limitations in oral conditions such as skeletal open bite or burning mouth syndrome have been surprising, in that neither was thought to be associated with the kinds of reported limitations; further research is clearly needed to better understand how functional limitation, as part of a disablement model (Osterweis, Kleinman, & Mechanic, 1987), applies to oral conditions in general and TMD in particular (Ohrbach, 2010).

In both the RDC/TMD Axis II and the DC/TMD Axis II, the Graded Chronic Pain Scale (GCP) was included in order to assess current level of psychosocial function (Von Korff et al., 1992). The GCP scale has been used primarily in conjunction with Axis 2 assessment of chronic orofacial pain patients to assess, in a single index, both the severity of pain, and the extent of pain-related interference with activities of daily living and extent of healthcare utilization. The seven items comprising the GCP scale are shown in Table 9.2. Prognosis is more guarded when self-reported activity limitations due to chronic pain are high and when pain interferes appreciably with ability to discharge responsibilities at home, school, or work and/or limits socializing activities.

Additional Useful Measures of Psychosocial Functioning

Multidimensional Pain Inventory (MPI)

The MPI is an important and widely used instrument to assess psychosocial function in

Table 9.2 Graded Chronic Pain Scale
(7-Item Scales)

Pain Intensity Rating (numeric rating scales)
On a 0 to 10 scale, where 0 is "no pain" and 10 is "pain as bad as could be," how would you rate your facial pain with regards to
1. Present pain?
2. Worst pain, past 6 months?
3. Average pain, past 6 months?
Pain Interference (numeric rating scales)
On a 0 to 10 scale, where 0 is "no interference" and 10 is "unable to carry on any activities," in the past 6 months how much has pain interfered with:
4. Take part in recreational, social and family activities?
5. Work?
6. Daily activities?
Days Lost
How many days in the past 6 months has pain kept you from your usual activities:
7. (0–180) Days

chronic pain patients (Kerns, Turk, & Rudy, 1985). The MPI is much longer than the simple GCP scale but provides somewhat more information for those who find it helpful in their clinical management and research to have a more detailed measure of psychosocial function. The MPI assesses pain impact (severity, interference), responses of others, and activities, and it enabled patients to be classified into dysfunctional, interpersonally distressed, and adaptive-coper subgroups. Such categorization has been very important theoretically for treatment planning because studies have shown that dysfunctional patients improved more when treatment of depression was added to standard appliance and biofeedback therapy. Acute TMD pain patients who were found to be dysfunctional and distressed on the MPI have been shown to be more likely to develop chronic TMD pain while the dysfunctional profile also has been shown to predict treatment failure. Recent research has questioned the temporal

reliability of the three classifications (Broderick, Junghaenel, & Turk, 2004), and current scoring of the MPI emphasizes the dysfunctional and interpersonally distressed dimensions rather than categorical classification (Rudy, 2005).

Substance Abuse

Substance abuse, principally with alcohol and narcotics, is frequently reported in the chronic pain and TMD literature to be more common than in the general population. Dentists may wish to consider the Alcohol Use Disorders Identification Test (AUDIT-C) as a brief screen for these problems. It uses 3 questions (How often do you have a drink containing alcohol? How many drinks containing alcohol do you have on a typical day when you are drinking? How often do you have six or more drinks on one occasion?). An even briefer screen for both alcohol and drug abuse is the 2-item conjoint screening test (TICS) (In the last year, have you ever drunk or used drugs more than you meant to? Have you felt you wanted or needed to cut down on your drinking or drug use in the last year?). These brief measures have been shown to have good sensitivity and specificity for detecting current substance use disorders. (Bush et al., 1998)

Sleep Disturbance

Disturbed sleep is a potent dysregulator of homeostatic bodily processes, and sleep disturbance is consistently reported to be higher among chronic pain and patients than in the population at large. The Pittsburgh Sleep Quality Inventory (Buysse et al., 1995) is a widely used and often recommended measure of sleep disturbance (Smith & Wegener, 2003). Alternatively, a single question such as "How is your sleep overall?" may serve as an adequate screen to detect the possible presence of a sleep disturbance warranting further pursuit. Once acknowledged by the patient, there are therapeutic modalities available to improve sleep, which range from medications, to sleep hygiene, to brief cognitive-behavioral therapy interventions.

Assessing Posttraumatic Stress Disorder, Physical and Sexual Abuse

In addition to the more commonly assessed psychological and psychosocial factors previously discussed, there are a number of other issues that seem to have direct relevance for at least some chronic TMD pain patients.

Posttraumatic Stress Disorder (PTSD)

PTSD is a psychiatric disorder that can occur following the experience or witnessing of life-threatening events such as military combat, natural disasters, serious accidents, or violent personal assaults like rape. People who suffer from PTSD often relive the experience through nightmares and flashbacks, have difficulty sleeping, and feel detached or estranged, and these symptoms can be severe enough and last long enough to significantly impair the person's daily life. We have shown that in addition to being highly prevalent in chronic orofacial pain, patients with TMD and PTSD present with a more complicated clinical picture that includes more intense pain and functional impairment when compared to those without PTSD (Sherman et al., 2005)

There is good evidence supporting a synergy between chronic pain, including chronic TMD pain and PTSD but what remains unknown to date is the predictive value of routinely assessing PTSD in such TMD pain patients. However, it seems reasonable that screening measures be used in cases where PTSD is suspected. This can be done using the Clinician Administered PTSD Scale (CAPS) 20 or the PTSD Checklist (Blake et al., 1990)

Physical and Sexual Abuse (Domestic Violence)

The literature contains numerous accounts of the frequent occurrence of physical and sexual abuse in chronic TMD pain patients. The lifetime prevalence of such domestic violence is estimated to be about 16% of the American population. While women are the most common the target of such abuse, men, the very young and the elderly are also targets.

Because the consequences can be so grave, and because the overwhelming tendency is to hide or deny any experience of abuse, it seems appropriate to recommend to clinicians treating patients where persistent pain is a dependable part of the clinical picture, that sensitive screening for issues of physical and sexual abuse be undertaken after a secure dentist–patient relationship has been obtained. The recommended assessment process in the so-called AVDR model is: Ask about abuse; provide Validating messages; Document presenting signs and symptoms; Refer victims to domestic violence specialists (Blake et al., 1990).

The Dentist as Biobehavioral Clinician: Guidelines for Biobehavioral Assessment Data and Management of TMD

As previously mentioned, it is recommended that biobehavioral assessment be conducted for screening purposes on all dental patients reporting persistent pain; the implication is that the practice of dentistry necessarily requires attention by the dentist to the biopsychosocial model as part of everyday dentistry: oral health does not stop at the boundaries of the masticatory system (Turner & Dworkin, 2004). When such psychological and psychosocial measures are incorporated into a routinely administered battery of history questionnaires, it is unusual to find resistance to these inquiries—instead many patients express gratitude for the clinician's interest in getting a comprehensive understanding of their total pain-related experiences. As a general rule, biobehavioral assessment is conducted, before the clinician encounters the patient, through the use of baseline history questionnaires. When resistance is met (“why are you asking me such personal questions” or “why do you need to know that”), it is recommended that the clinician accepts the patient's hesitance and allows them not to answer any or all questions deemed sensitive or irrelevant. Again, this rarely occurring resistance is best responded to with empathy and support, together with a brief explanation of

how the desired information allows the clinician to better understand how patients are coping with this condition, and that such questions do not imply that the cause of their problem is psychologically related. Table 4.1 offers a summary of these guidelines and recommendations.

The label biobehavioral has gained acceptance as a collective term to refer to treatment approaches for chronic pain derived from applying behavioral science theories and methods to changing the perception and appraisal of pain and ameliorating or eliminating the personal suffering and psychosocial dysfunction that often accompany persistent pain conditions (National Institutes of Health, 1995). Indeed, the NIH funded OPPERA study (Orofacial Pain: Prospective Evaluation and Risk Assessment; Maixner et al., 2011) exemplifies the significance of incorporating biobehavioral measures into complex theoretical models amenable to empirical investigation. The OPPERA study was designed on the basis of a heuristic that predicts genetic contributors to psychosocial dysfunction and pain amplification, each of which in turn contribute to the development and maintenance of pain disorders such as TMD in the context of background variables such as gender, age, health status, and trauma (Diatchenko et al., 2006). In the context of that heuristic, the items within a measure of psychosocial dysfunction, such as depression or stress reactivity, are assumed to reflect the state of the associated part of the central nervous system.

The biobehavioral pain management modalities are drawn more specifically from cognitive-behavioral therapy (CBT) as well as educational approaches; these psychologically based therapies include biofeedback, relaxation, imagery and hypnosis. Substantial evidence has emerged over the past two decades that such modalities are safe and effective in the management of chronic pain conditions (Vlaeyen & Morley, 2005); these biobehavioral treatments (National Institutes of Health, 1995) constitute a component of virtually every chronic pain treatment

program and the management of chronic orofacial pain, notably TMD, has benefited from such biobehavioral interventions as well. Overwhelmingly, these methods emphasize as their common objectives self-management and the acquisition of self-control over not only pain symptoms but cognitive attributions or meanings given to those symptoms and, most importantly, to maintaining a productive level of psychosocial function, even if pain is not totally absent. Our own and others' research has shown in repeated randomized clinical trials how CBT, including use of education, relaxation and relapse prevention strategies may be applied in general or specialty dental offices, by dentists or, in many cases of chronic TMD-related pain, by qualified members of the dental office staff (Dworkin et al., 2001), (Turk, Zaki, & Rudy, 1993). Alternatively, the dentist may elect to refer to a mental health professional—psychiatrists, clinical psychologists and qualified psychiatric social workers, those chronic orofacial pain patients who have been identified by biobehavioral screening as burdened with heightened psychological or psychosocial disability (Dworkin et al., 2002).

By and large, when biobehavioral treatments are employed in the management of chronic orofacial pain, effects are virtually always positive and in the hypothesized beneficial direction, though often effects are moderate in size. However, these biobehavioral methods, especially those subsumed under the label 'cognitive-behavioral,' appear to have the potential for producing long-lasting benefits that exceed those observed with usual clinical treatment for TMD. It should be noted conservative, noninvasive approaches to TMD management are increasingly being advocated as the preferred overall treatment approach for this hard-to-understand chronic pain problem (Stohler & Zarb, 1999; Greene, 2010). These so-called "conservative" treatments generally incorporate many of the same elements (i.e., relaxation, stress-education, habit behavior modification, etc.) found in cognitive-behavioral and biobehavioral therapies for TMD. Thus, both usual

clinical treatment for TMD and biobehavioral treatment employ multimodal approaches and it does not yet appear possible to identify or separate which of the multiple therapeutic components are most efficacious. If one method had to be singled out, relaxation seems to emerge consistently as an effective method for chronic pain management across a wide variety of pain conditions and over a wide variety of clinical settings. In any event, of the combined biobehavioral methods commonly used in clinical practice and in research, one method has as yet failed to emerge as superior to another.

It is important to note that much the same situation obtains with regard to biomedically based TMD treatments. Little is known about the superiority of any one of the multiple methods commonly employed to biomedically manage TMD—there is no strong scientific evidence to substantiate invasive versus noninvasive treatments or pharmacological treatments emphasizing analgesics versus those stressing anti-depressants or muscle relaxants. It is the absence of compelling evidence to the contrary which has led many clinical researchers to advocate conservative, reversible therapies for the largest number of TMD patients.

Summary

Psychological and psychosocial factors are universally accepted as prominent features among patients seeking treatment for amelioration of the pain associated with chronic orofacial pain, including, TMD. Indeed, for a significant number of chronic TMD pain patients, these pain-related emotional and behavioral factors may represent the major burden their condition imposes, putting an important stamp on the clinical presentation. While definitive information is not yet available regarding whether such emotional and behavioral factors are causes or effects of TMD pain, it is nevertheless widely accepted that comprehensive management of such patients requires attention to these issues. In practical terms, this means assessing levels of

psychological and psychosocial disturbance in order to determine whether or not treatment decision-making should also include recommendations for incorporating psychological and/or behavioral management into comprehensive TMD treatment. In terms of clinical utility for biomedical clinicians seeking to provide the most comprehensive treatment for their chronic TMD pain patients, four domains of psychological and psychosocial assessment are recommended: (1) Pain; (2) oral parafunctional behaviors; (3) Psychological status—principally, depression, anxiety, and nonspecific physical symptoms; and (4) Physical functioning of the jaw, and psychosocial level of function as related to quality of life and use of healthcare services or medications. The RDC/TMD has offered, for the past 20 years, an innovative conceptual approach and a battery of reliable and valid measures that have gained wide acceptance and use. The DC/TMD now replaces the RDC/TMD, with better and expanded Axis II measures while reinforcing the biopsychosocial conceptual model. Psychological domains worthy of assessment but not incorporated into the DC/TMD include substance abuse and sleep disturbance. Additional domains seemingly relevant to a comprehensive assessment of the TMD patient include physical/sexual abuse, and PTSD. Finally, the major thrust of this chapter has been to persuade the reader that a biopsychosocial approach—the model system that guides all major multidisciplinary pain centers—should be used by all clinicians treating TMD patients. Current scientific evidence overwhelmingly confirms that this approach enhances both the understanding and the management of all chronic orofacial pain conditions.

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10

Chairside Techniques for Reducing Dental Fear

Ronald W. Botto, Evelyn Donate-Bartfield, and Patricia Nihill

Key points

- Dental fear contributes greatly to avoidance of dental care.
- Discussing a patient's fear actually helps reduce their anxiety.
- Four A's of interacting with an anxious patient: **A**sk, **A**ssess, **A**cknowledge, **A**ddress.
- Chairside behavioral techniques have been shown to be effective in reducing dental fear and anxiety for many apprehensive patients.
- A brief progressive relaxation procedure which combines progressive relaxation with guided imagery and suggestion is described and the actual procedure is included.
- Extremely anxious dental patients may require referral to a mental healthcare provider for more complex behavioral interventions.
- Ethical issues associated with addressing dental fear are examined.

How, when, or why it happened is a mystery to me, but somehow I've developed a dental phobia so extreme as to keep me away from a dental office most of my adult life. Just mentioning the word "dentist" made me cringe. Hearing an orthodontic or toothpaste commercial on radio or TV made me run from the room.

[Adult female]

I don't know, just the word "dentist" does something to me. So after I got in the chair, I asked the dentist if I could go to the bathroom. He said "yes," so I went to the waiting room, grabbed my hat and coat, and ran out.

[Adult male]

These quotes from two different dental patients, while perhaps somewhat extreme, are not uncommon. As authors of other chapters in this book have shown, dental fear is probably one of the most prevalent problems that dentists face in treating patients. Dental fear contributes greatly to avoidance of dental care (Morse, 2002), and if sought, makes the experience trying for the patient, staff, and dentist alike (Moore & Brodsgaard, 2001), and can impact the patient's life negatively (Cohen, Fiske, & Newton, 2000; Locker, 2003). While practitioners and their staff may feel that avoiding the issue and just working fast to get the patient out of the chair is the best approach, not resolving a patient's anxiety can lengthen appointments, exacerbate pain perception, and reinforce negative attitudes, making subsequent appointments even worse.

The purpose of this chapter is to serve as a "reader's guide" to performing a few of the many different behavioral techniques that can help reduce patient fear. One approach to categorizing the various behavioral interventions is according to the role that relaxation plays in each. Thus, one can identify (a) non-relaxation-based techniques, (b) "quasi-relaxation"-based techniques, and (c) relaxation-based techniques.

Non-relaxation-based techniques are those that employ intervention strategies that do not

utilize relaxation types of procedures (directly or indirectly) in their implementation. Examples of procedures of this type would include communication skills (including the redefining of sensations), distraction, behavior modification, modeling, cognitive restructuring or cognitive behavior modification, stress inoculation, iatrosedation, and acupressure. Quasi-relaxation-based techniques are those that achieve relaxation indirectly, without employing a formal progressive muscle relaxation procedure. Examples are guided imagery, paced breathing, biofeedback, graduated exposure, and meditation. Relaxation-based techniques incorporate progressive relaxation-type procedures directly as part of the intervention. Included in this category would be progressive relaxation, systematic desensitization, and hypnosis.

These techniques vary in terms of both expediency and the level of training needed to use them effectively, with hypnosis requiring the most formal training to be both safe and effective. It should be noted that the techniques described can be effective when performed by dental practitioners in their offices. However, despite a dentist's best behavioral management efforts, there are some apprehensive patients that would benefit from referral to a mental health practitioner. These referrals need to be made in a sensitive, empathetic, and supportive fashion to encourage the patient to obtain the help needed. Many dentists are uncomfortable making mental health referrals, but dental anxiety problems can be successfully managed (Kvale, Berggren, & Milgrom, 2004), and requests for consultation are appropriate and welcomed by mental health professionals. Similar to a general dentist referring a patient to a dental specialist, collaboration with a mental health practitioner allows the opportunity for dentists to provide patient-centered care for their most anxious patients in a team approach. Good partnerships between dentists and mental health specialists can help patients develop long-lasting solutions to problems caused by dental anxiety (Donate-Bartfield, Spellecy, & Shane, 2010).

Because the degree of complexity varies for the aforementioned approaches that the dental practitioner can utilize, the techniques chosen to be used should reflect the degree of fear the patient is experiencing. For mild anxiety, simple non-relaxation procedures such as distraction may be adequate (Corah, Gale, & Illig, 1979). In general, complexity increases from non-relaxation-based techniques to relaxation-based techniques. In addition, relaxation-based techniques, while effective for all levels of patient anxiety, would usually be more appropriate for moderate to high levels of fear than mild levels of fear. For example, using a relaxation procedure on a patient who feels mildly apprehensive would be effective, but would not be an efficient use of either the patient's or practitioner's time. Because of space limitations, only a few representative and relatively easily implemented interventions will be discussed here.

Non-Relaxation-Based Techniques

Communication

First (and foremost) on the list of intervention techniques is that of communication (van der Molen, Klaver, & Duyx, 2004). Two studies of fearful dental patients reported that dentist's attitudes or comments regarding the patient's oral state were one of the situations they feared the most (Gale, 1972; Stouthard & Hoogstraten, 1987). When an anxious patient who has avoided dental treatment does present to a dental provider, it is imperative that rather than condemn their poor oral health, the dentist should commend the patient on taking the first step toward dental health by actually arriving at the dental office to seek help. This initial encounter can provide cues to the patient's avoidance and potential dental fears. The dentist who takes the time and listens to the patient will learn the most about their concerns.

Listening skills are the basis for effective communication and are actually a foundation

skill for all of the other techniques. In interpersonal communication, it is not only critical that the listener does indeed listen, but that the speaker also feels heard. One common cue that the patient is not feeling heard or understood is that their statements continue to be repeated. Techniques such as paraphrasing and reflective listening, which are discussed later, are useful tools for helping the patient to feel understood.

Before discussing some specific communication skills, the question of whether or not to even communicate needs to be addressed. Some practitioners hold the belief that discussing fear with the patient "will make it worse," including concern over employing questionnaires such as Corah's Dental Anxiety Scale (Corah, 1969). Humphris, Clarke, and Freeman (2006) have examined this issue and found that completing a variation of Corah's Dental Anxiety Scale (Modified Dental Anxiety Scale) before dental treatment did not have a negative impact on patients' anxiety levels. Furthermore, Dailey, Humphris, and Lennon (2002) assessed the impact of patients completing the Modified Dental Anxiety Scale and then sharing the results with the dentist. The results clearly showed that patients preferred to have their dentist aware of their fear. Thus, the problem is generally not with patients expressing their fears, but what the practitioner does with that information.

The practitioner or staff will commonly attempt to "reassure" the patient by stating something along the lines of, "Don't worry; everything will be fine," or "There's nothing to be afraid of." Although well-intentioned, reassurance is ineffective, causing the patient to feel that their concerns are being dismissed or diminished (Chambers & Abrams, 1992). A "quick affirmation" of this concept can be experienced by the reader by simply taking a couple of minutes to reflect on something they consider very threatening and then imagining someone saying, "Don't worry; everything will be alright," and seeing how much it diminishes the perceived threat. Instead of attempting to

directly reassure the patient, it is more effective to listen empathetically and teach interventions that resolve the patient's apprehension. In other words, reassurance is the outcome, not the intervention.

The first step in communicating with patients about their fears is to determine whether or not the patient is fearful. As mentioned earlier, patients who are fearful want the dentist to know how they feel. While many different assessment tools exist for this task, formal quantification is more critical for research purposes than for clinical treatment. The practitioner will usually find it sufficient to simply ask each patient, "How apprehensive or fearful are you about having dental work done?" If the patient answers, "Not at all," nothing else needs to be discussed on this topic, and the patient will appreciate the practitioner being sensitive and caring enough to ask. If the patient answers anything greater than that, even "A little," then the practitioner needs to gather additional information regarding what types of things bother the patient, how anxious each activity makes them, share with the patient what the practitioner has heard the patient say, and then let the patient know that there are a number of things that the practitioner can do to help the patient feel more comfortable. This discussion should normally be part of the initial diagnostic interview with each patient.

It is important in the preceding discussion that the practitioner state clearly to the patient that he/she understands the patient's fears rather than evaluate their "validity." This is simply accomplished by stating "I understand," and then stating back to the patient what they understand the patient to be saying. This reflection can include both the content and feelings that the practitioner understands the patient to be expressing.

There may not always be concordance among the various ways that fear can be expressed (verbal, behavioral, physiological), called "response desynchrony." A patient may say that they are relaxed, yet be gripping the chair, tense, sweating profusely, and/or breath-

ing shallowly. The opposite could also occur, in that the patient may say that they are anxious, but show no other signs of fear. A simple rule of thumb is to address any messages that might be associated with apprehension, whether they are verbal, behavioral, or physiological. A simple method to remember the above-mentioned communication points is to think about them as the "Four A's of Anxiety": (1) Ask how anxious they are, (2) Assess the causes, (3) Acknowledge what you have heard, and (4) Address their fears by offering solutions.

Other communication guidelines include the careful choice of terms used. Anxiety-producing terms or phrases such as "give a shot," "cut down a tooth," "pull your tooth," "have a root canal," or "This may hurt a bit," should be avoided. Instead, terms such as "get the area numb," "shape the tooth," "remove the tooth," "endodontic treatment," or "pinch or sting a little," are preferable. In addition, avoid describing the instruments used. Telling a patient about using needles, syringes, files, scalpels, or forceps is not going to comfort them. Finally, only make promises that can be backed. While this may seem obvious, it is not uncommon to hear the following statement, "Before we start, we will numb you up so you won't feel anything." Local anesthesia rarely renders the patient devoid of sensation. As a result, the sensations that are perceived (e.g., movement, pressure) are often interpreted by the patient as indicating insufficient anesthesia, and therefore often perceived as painful. Instead, let the patient know what sensations will be perceived following anesthesia (e.g., "You will feel pressure and vibration"). In addition, it has been shown that providing highly anxious patients with information regarding the dental procedure and recovery reduces their anxiety levels (Ng, Chau, & Leung, 2004).

A final communication "rule" to be mentioned is to ensure that the patient has a means of communicating while the practitioner is working and the patient's mouth is open. In spite of the recurring comic parodies of a dentist conversing with a patient whose mouth is open

and full of instruments, patients at times feel reduced to this form of “communication.” A more effective way for the patient to “communicate” when verbal methods are limited is to tell the patient to signal the practitioner when the discomfort gets too great, or if he/she wishes the practitioner to stop. This approach has the added benefit of giving the patient the perception of being in control during the procedure, thereby reducing fear, and playing an important role as an antecedent to, and consequence of the patient’s dental experience (Milgrom, Weinstein, & Getz, 1995).

One easily implemented signal is to tell the patient to raise the hand opposite the practitioner. It is important that the practitioner honor the guidelines that he/she has set, and cease working when the patient signals discomfort. Extremely anxious patients, especially children, may “test” the practitioner by raising their hands before any procedure actually occurs. It is important that the dentist stop as promised. At the same time, the practitioner needs to address the patient’s “testing” and let the patient know that he/she must be accurate when signaling and only use it when too uncomfortable to continue. Also, when administering local anesthesia, discomfort primarily occurs while inserting the needle and when injecting the anesthetic (Kudo, 2005). When the patient raises his/her hand, the practitioner can acknowledge the signal by stopping the injection process, saying, “OK,” but not removing the needle. After a brief pause, the process can be continued. In this way, although there may be a number of pauses, the process will be completed and the patient will feel more at ease.

Distraction

Distraction is an easily utilized method of reducing a patient’s apprehension during the occurrence of uncomfortable sensations. Most commonly taught and used is the “jiggling” of the patient’s cheek during the administration of local anesthesia. Another technique commonly used with children is asking them to hold their

leg up in the air. While both of these can be helpful, they can have limited utility.

The purpose of distraction techniques is to refocus the patient’s attention away from the potentially painful stimulus or procedure. Distraction techniques can be grouped into two main categories: physical methods and mental methods. Both are effective and can be employed separately or in combination.

Physical methods include the aforementioned cheek-jiggling and leg-raising. Other methods include listening to music or recorded books through earphones, playing video games, watching movies or other recorded programs, virtual reality on monitors or specially constructed glasses, rubbing the cheek of the patient or massaging their gums during injections, or simply asking the patient to count to themselves the holes in the acoustic tiles in the ceiling over the operatory (Corah et al., 1979; Frere et al., 2001; Lahmann et al., 2008; Furman et al., 2009).

One particularly easy and effective physical distraction method is the use of breath control. In this method, the patient is asked to pace their breathing according to the practitioner’s directions, while the dental procedures are taking place. Have the patient place their hands on their stomach, and then direct them to breath according to a pattern while performing dental procedures. First have the patient take a deep breath, hold their breath briefly, and then let it out slowly. Then have them take a normal slow breath. Next have them take another deep breath, briefly hold it, then let half out, hold it, then let the rest out. Again, take a normal breath. Follow this by having the patient let their breath out a third at a time, a quarter at a time, a fifth at a time, and so on. Between each paced breath, have the patient take a slow normal breath. This helps the patient relax in a couple of ways. First, it distracts the patient by having them focus on their stomach rising and falling with each breath as well as the task of controlling their breathing. Second, it slows down the patient’s respiration, and by inducing deep diaphragmatic breathing, will stimulate the parasympathetic nervous system, which is associated with relaxation.

Cognitive methods of distraction include various “mental exercises” that the patient can engage in while the practitioner is performing particularly stressful parts of a procedure. Examples include having the patient count backward to themselves from 100 by 3’s, then 4’s, saying the alphabet backward to themselves, solving mathematical long division or multiplication problems in their head, or having the patient think about different events such as holidays or birthday celebrations (assuming the patient considers them positive and nonstressful).

Quasi-Relaxation-Based Techniques

As stated earlier, these are referred to as quasi-relaxation-based techniques because they employ relaxation indirectly. For example, when using biofeedback, the patient is not routinely instructed in formal progressive relaxation, but simply asked to relax and reduce the muscle tension in the measured area. It is not uncommon for the patient to relax the measured muscles in their body while simultaneously relaxing other muscle groups such as their frontalis or masseter muscles. In paced breathing, similar to the breath control method mentioned earlier, the patient is taught to regulate their breathing in a rhythmic fashion, which is timed to a signal, often a metronome. This regulation of breathing results in the same type of physiological reaction discussed before.

Guided Imagery

Guided imagery is a more elaborate version of the mental distraction technique discussed earlier involving the patient thinking about positive events. In guided imagery, ask the patient about particularly pleasant, relaxing scenes they would like to imagine. Tell the patient that you want them to remember as much detail as possible because after the dental procedure is over, you want them to describe to

you what they were imagining. Once the patient identifies the specific scene(s) they would like to imagine (e.g., relaxing on a particular familiar beach, sitting in a park at a particular season), the patient is asked to get relaxed, close their eyes, engage in slow regular breathing, and begin imagining the scene in as much detail as possible. The patient’s imagery should incorporate as many senses as possible (sight, sound, smell, touch, taste), and again, be as specific as possible. Directions by the practitioner such as “notice the color of the sky; listen to the children playing in the distance, smell the ocean . . .” can be used. The practitioner can periodically reinforce the patient’s imagery activity by telling the patient to “continue to imagine yourself enjoying relaxing [wherever the scene is]” or, if more than one scene was suggested by the patient, suggesting that the patient switch scenes if he/she wishes. After the dental procedure is over, the dentist should discuss the experience with the patient, asking for a description of what the patient was imagining, how well it worked, and what would enhance its effectiveness.

There are a number of variations of guided imagery, which vary in complexity. In the previously discussed method, the patient is simply asked to relax before engaging in the imagery (Milgrom et al., 1995). Other versions include a 15- to 20-minute formal relaxation procedure prior to the imagery (Geboy, 1985). In this case, the procedure would be included in the next category of relaxation-based techniques and entail more time.

Relaxation-Based Techniques

These methods employ a formal progressive muscle relaxation (or, as in the case of hypnosis, a relaxation-like) procedure as part of the method, or as the intervention itself. The methods most commonly employed in this category would be progressive relaxation, modified systematic desensitization, and hypnosis. Of these, hypnosis should only be used after

formal training. Systematic desensitization involves first training the patient in relaxation, then gradually introducing the patient to the feared stimulus in a highly structured fashion, from lower levels of fear to the higher levels. The progression to each next higher level only occurs when the current level of feared stimulus can be imagined without inducing fear. While the level of modified systematic desensitization used by the dentist does not require the degree of formal training that hypnosis does, it can be fairly time-consuming. As a result, both systematic desensitization and hypnosis are often recommended primarily for extremely anxious or phobic patients, and are often accomplished in the office of a mental health practitioner to whom the patient has been referred. It should be noted, however, that formal training in hypnosis for dentists is available (the interested reader should contact the American Society for Clinical Hypnosis, or the Society for Clinical and Experimental Hypnosis regarding training workshops) and, once trained, can be effectively used in the dental office by the dentist (Patel, Potter, & Mellor, 2000; Finkelstein, 2003).

Traditional formal progressive deep muscle relaxation can also be a rather lengthy procedure and can require multiple sessions of patient training. In its traditional format, it can be even more time-consuming than many hypnosis procedures. As such, it is not very adaptable to the dental office or clinic. Typically, it involves the patient reclining comfortably, closing his/her eyes, and focusing on various groups of muscles, which they alternately tense and relax, while breathing in a regular, paced fashion. This process continues with each of the major muscle groups of the body until all muscles are relaxed and the patient is at ease. Each session can take anywhere from 20 or 30 minutes to 1 hour, depending on the practitioner. Because of the time involved with traditional progressive relaxation procedures, they are usually recommended for, and effective with, those patients who express moderate to high levels of fear (Berggren, Hakeberg, & Carlsson, 2000). They can also be effective with phobic patients who

can at least enter the dental office, since by relaxing in the dental chair, they will, in effect, be accomplishing *in vivo* desensitization.

The procedure that will be discussed here is a Brief Relaxation Procedure developed by the principal author that can be read to the patient in approximately 12–15 minutes (see Appendix). It incorporates not only bodily relaxation and breath control, but also includes a brief guided imagery segment, and specific suggestions regarding relaxation and personal control. As a result, it combines many of the advantages of both guided imagery and hypnosis with those of progressive relaxation without most of the time disadvantages of each. In addition, it lends itself to audio recording so that it can be performed in a “generic” version for all patients. Audio recordings, however, are more effective when made specifically for each patient when first administered, and then taken home by the patient to practice. The patient can then arrive at the office highly skilled in the procedure and “self-administer” it during successive dental appointments.

To best understand the usefulness of this specific procedure, a classification system first introduced by Davidson and Schwartz is helpful (Davidson & Schwartz, 1976). They discussed two main components of anxiety: somatic and cognitive. Somatic anxiety is that which is experienced predominantly in a bodily fashion, while cognitive anxiety is that which is experienced predominantly in a mental fashion. Fear and anxiety can be high or low on both or either of the two continuums (Fig. 10.1).

An example of anxiety that is low on the cognitive continuum but high on the somatic continuum would be someone who is feeling fidgety or shaky, but has no particular thoughts in mind. An example of the opposite, high cognitive anxiety but low somatic anxiety, would be someone who is physically relaxed, but whose mind is racing with anxious thoughts. One can also classify anxiety reduction procedures in a similar fashion. Thus, procedures such as distraction or paced breathing are most effective with low to moderate cognitive and/

		Somatic Anxiety	
Cognitive Anxiety	<u>Mod.</u>	<u>Moderate</u>	<u>High</u>
		Paced Breathing Distraction Meditation Graduated Exposure Rehearsal	Progressive Relaxation Biofeedback
	<u>High</u>	<u>Moderate</u>	<u>High</u>
		Guided Imagery Cognitive Restructuring Stress Inoculation Thought Stopping	Guided Imagery + Relaxation Systematic Desensitization Hypnosis Botto Brief Relaxation

Fig. 10.1. Somatic and cognitive orientation of various relaxation methods. Adapted from Davidson and Schwartz (1976).

or somatic anxiety, while procedures such as systematic desensitization and hypnosis are most effective with high levels of somatic and/or cognitive anxiety. Those techniques that focus predominately on physical relaxation such as biofeedback and traditional relaxation are most effective for somatic anxiety, while those techniques that involve a strong mental component such as guided imagery or cognitive restructuring (the changing of irrational thinking) are most effective for cognitive anxiety. The Brief Relaxation Procedure discussed here includes both cognitive components (imagery and suggestion) as well as somatic components (muscle relaxation and deep breathing). As a result, as with systematic desensitization and hypnosis, it is effective with both high somatic and cognitive anxiety. Because of its efficiency in presentation, it can also be a highly effective and helpful intervention for patients who are moderately anxious as well (both cognitively and/or somatically).

The actual script for the Brief Relaxation Procedure, which can be read to patients since they will have their eyes closed, is located in the Appendix. As noted in the script, it takes only approximately 12–15 minutes to read the procedure to the patient and has been shown to be very effective. The procedure involves four main phases: rapport, relaxation, suggestion, and mental imagery. In the preparation phase, the patient is educated about the procedure and how it works. The main purpose of this phase

is to set expectations regarding the procedure's efficacy. This phase is critical. The same detailed relaxation procedure has been shown to both raise or lower anxiety levels depending on expectations resulting from suggestions given to the individual (Botto, 1981). The practitioner is also directed to answer patient questions and elicit information regarding the patient's preference of a scene for the imagery phase of the procedure, much in the same way as discussed earlier in the guided imagery technique. Finally, information regarding any particular area of the body that the patient tends to feel especially tense is included.

The relaxation phase of the procedure consists of three steps: (1) selecting a group of muscles and relaxing those muscles, (2) taking two deep breaths, and (3) suggestions to feel "calm, controlled, and relaxed." The script starts by having the patient tense and then relax the muscles of the feet to experience "the contrast between tension and relaxation." After that, muscle groups are not tensed. The patient is simply asked to focus on tension already present in each muscle group and then relax each group. An example of the wording used for each muscle group is as follows:

Now think about the muscles in your back and shoulders. Concentrate on the muscles in your lower and upper back, your shoulders, and any tension in them. Think about them . . . think about them . . . now relax

them. Relax them and feel the tension draining down . . . down from your shoulders and back . . . down from your legs . . . down from your feet . . . down and away. All the tension draining down, draining away. Letting your muscles go limp, limp, heavy and limp. Breathing deep . . . and slow. Deep . . . and slow. Feeling relaxed and comfortable; relaxed and at ease; calm, controlled, relaxed, and at ease. By being relaxed, you have better control over your thoughts, feelings, and actions.

Six different muscle groups are included: the feet, legs (lower and upper legs), back and shoulders, stomach and chest, arms and hands, and neck and head. If the patient has indicated any particular areas in which tension tends to be felt, those areas would also be included.

Once the muscle groups are relaxed, suggestions to maintain relaxation are given and the relaxation is reinforced. At this time, the mental imagery phase begins, and a detailed "picture" of the patient's scene is described for the patient. The description, as with Geboy's (1985) guided imagery, appeals to four of the five senses mentioned earlier (sight, sound, smell, and touch). By being relaxed, the patient is more suggestible and better able to engage in visualizing the scene.

That completes the relaxation procedure, and the practitioner is able to begin the dental procedures, periodically reinforcing the patient's relaxation, especially if the patient starts to become tense, or during a particularly difficult treatment phase. Once the dental procedure is completed, if necessary, directions for removing the relaxation can be given. Afterward, the practitioner conducts a debriefing with the patient, reinforcing the patient's performance as well as soliciting feedback regarding the experience (e.g., how did the patient feel about it; what worked particularly well; what, if anything, would the patient like changed the next time). The patient is then directed to continue to practice the relaxation procedure at home.

Conclusions

One final word should be mentioned about the use of behavioral interventions compared to pharmacological interventions. While the latter tend to be commonly used (e.g., premedication, N₂O, IV sedation), the major problems with their use are twofold. First, they can carry potential danger in both their direct effects and side effects. Second, their amelioration of patient fear tends to be short term (Johren et al., 2000; Thom, Sartory, & Johren, 2000). Each time the patient experiences dental procedures, the agent must be readministered, taking time, adding cost, and exposing the patient, and sometimes staff, to risk. In addition, the patient learns to depend on these pharmacological interventions to feel relaxed during dental procedures, requiring their continued use.

Perhaps more importantly, there are benefits conferred by nonpharmacological approaches that are not found with pharmacological approaches for managing fear and anxiety. Since behavioral procedures help the patient "unlearn" their fears and resolve them by actively learning coping skills (Hakeberg, Berggren, & Carlsson, 1990; Hakeberg et al., 1993), patients attribute their success to their own efforts rather than to a drug. This self-attribution is very empowering for the patient in gaining control over fear (Liddell & Locker, 2000). Facing and overcoming an immobilizing fear by one's own effort is a significant achievement for a patient, and participating in this effort supports a dentist's desire to enhance their patient's optimal well-being. Using language from the ethics code, giving patients true choices about how they will manage their dental fear and investing time in teaching patients skills that will facilitate further dental care maximize both beneficence and autonomy (Donate-Bartfield et al., 2010). Finally, dental practitioners themselves also benefit from nonpharmacological approaches: practitioners will find that taking the time to show patients they care about their comfort and well-being will result in highly satisfied patients and strong practices.

In the words of the first patient quoted at the beginning of this chapter, after being taught relaxation,

And best of all, my bottom teeth, at least the ones I have left, feel so clean and smooth. Why I waited all these years to get this work done is beyond me. It probably has something to do with the fact that as a child, I can remember having cavities drilled without anesthesia, and numbing shots administered without any topical. All of this from way back in the dark ages of dentistry. You've come a long way baby!

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11 Sleep and Awake Bruxism

Alan G. Glaros and Cody Hanson

Key points

- Sleep bruxism, characterized by rhythmic masticatory muscle activity and grinding sounds, appears throughout life and occurs in about 8.0–8.4% of adults. Tooth wear is the most common effect of sleep bruxism.
- Awake bruxism is characterized by clenching and can produce pain in the masticatory muscles and temporomandibular joint. Awake bruxism occurs very frequently in adults, especially those reporting masticatory muscle pain.
- Multiple physiological events accompany an episode of sleep bruxism. There is little consistent evidence supporting the role of occlusion in sleep bruxism. Awake bruxism is probably related to behavioral processes and lack of proprioceptive awareness.
- Stress and other behavioral factors can play a role in both sleep and awake bruxism.
- Sleep polysomnography is the “gold standard” for the diagnosis of sleep bruxism. Self-report or electromyographic (EMG) monitoring are typical methods for assessing awake bruxism.
- There is no definitive treatment for sleep bruxism, although splints are often used to reduce its damaging effect on teeth. Multiple behavioral techniques, including alarms, biofeedback, and habit reversal show promise in the treatment of these disorders.

Bruxism is a repetitive jaw-muscle activity that is typically characterized by grinding or clenching of the teeth. Bruxism has two distinct manifestations: it can occur during sleep (sleep bruxism) or during wakefulness (awake bruxism) (Lobbezoo et al., 2013).

This chapter will describe the prevalence of bruxism and discuss its effects on teeth and other bodily systems. We will present several etiological theories of bruxism and discuss the relationships between personality traits and bruxism and between stress and bruxism. Methods for diagnosing and treating the disorder will conclude the chapter.

A considerable proportion of the published literature does not distinguish between events occurring during sleep or during wakefulness or between clenching and grinding behaviors. As a result, it can be difficult to know whether grinding during sleep, clenching during wakefulness, or other behaviors contribute to our understanding of bruxism. To the extent possible, this chapter will distinguish between sleep and awake bruxism and between grinding and clenching. When primary sources do not distinguish between sleep and awake bruxism or between grinding and clenching, we will note this by referring to oral parafunctional behaviors.

Prevalence

Sleep bruxism can begin in early childhood and last throughout adulthood. Tooth grinding can occur as soon as teeth erupt and may increase in frequency during early and middle childhood. Sleep bruxism is a relatively common, intermittent problem in children, occurring in 14% to more than 20% of children (Lagerberg et al., 2000; Ng et al., 2005). A small proportion of childhood sleep bruxers will continue these behaviors into adolescence and adulthood (Carlsson, Egermark, & Magnusson, 2003).

Sleep bruxism is relatively common among adults. Multiple international studies using large samples suggest that sleep bruxism (or

teeth grinding) occurs in 8.0% to 8.4% of adults (Lavigne & Montplaisir, 1994; Ohayon, Li, & Guilleminault, 2001; Choi et al., 2002). Sleep bruxism is more likely to occur in a supine position (Miyawaki et al., 2003). Risk factors for sleep bruxism in adults include smoking, caffeine intake, heavy alcohol drinking, Type A personality, anxiety, snoring, sleep apnea, and periodic limb movements (Lavigne et al., 2007). In adults, the prevalence of sleep bruxism decreases with age.

Prevalence data on awake bruxism, often equated with daytime clenching, are not as readily available. When daytime clenching is defined as tooth contact of any intensity, adults without pain problems report tooth contact occurring 45% of the time (Glaros, Williams, & Lausten, 2005), as measured by experience sampling techniques. When tooth contact is assessed via questionnaire in medical patients without chronic head pain, tooth contact occurs 40% of the time (Glaros & Williams, 2012). Individuals with temporomandibular disorder pain or head pain report tooth contact more than 70% of awake time (Glaros et al., 2005; Glaros & Williams, 2012). Based on the painful consequences of chronic tooth contact, women are more likely to engage in awake bruxism than men, and the prevalence of awake bruxism appears to diminish after age 45.

Twin studies indicate no substantial heritability of oral parafunctions (Michalowicz et al., 2000). Monozygotic twins (MZ) are no more similar than dizygotic twins on oral parafunctions, and reared-together MZ twins are no more similar than reared-apart MZ twins.

Effects of Bruxism

The most common correlate of sleep bruxism is abnormal tooth wear (see Fig. 11.1). Diet and harsh environmental and climatic conditions (e.g., high levels of sand or grit) may also contribute to wear. The wear observed in sleep bruxism patients is due in part to bilateral mandibular excursions, small lateral movements,



Fig. 11.1. Severe tooth wear in a sleep bruxer. Reprinted from Kelleher, Bomfim, and Austin (2012) "Biologically based restorative management of tooth wear," *International Journal of Dentistry*, vol. 2012, Article ID 742509.

and unilateral excursions occurring during sleep. The amount of force exerted during sleep bruxing behaviors may exceed amplitudes generated during maximum voluntary bite force (Ohayon et al., 2001). Hypertrophy of the masticatory muscles may be observed in patients who report sleep bruxism. In more severe cases, the behaviors associated with sleep bruxism can lead to tooth fractures.

Although the destructive effects of sleep bruxism are well-known, the disorder may also have functional utility. In a study of patients with obstructive sleep apnea and sleep bruxism, audible grinding events typically occurred at the end of an apnea or hypopnea event. Treatment with a continuous positive airway pressure device eliminated audible grinding (Oksenberg & Arons, 2002). In nonbruxism subjects, experimental acidification of the lower esophagus led to rhythmic masticatory muscle activity (RMMA), sleep bruxism, and increased swallowing (Ohmure et al., 2011). These findings suggest that sleep bruxism and associated physiologic events may have protective effects in some individuals.

The most common correlate of awake bruxism is pain in the muscles of mastication or in the temporomandibular joint (TMJ) (Glaros, 2008). A high frequency of awake bruxism (i.e.,

tooth contact) is also associated with common headaches (Glaros, Urban, & Locke, 2007). However, the relationship between sleep bruxism and pain is much less clear. When sleep bruxism is limited to nocturnal grinding behaviors, there is little evidence that grinding is associated with myofascial pain (Rompré et al., 2007).

Increased healthcare expenses are a societal cost of bruxism. Patients with these conditions have a larger number of visits to dentists, physicians, and other healthcare providers (Molina et al., 2000) than nonbruxism controls. They also use more medications than controls. The individual social costs of sleep and awake bruxism cannot be estimated accurately, but they may include decreased productivity at work or school, strained relationships with bed partners, and pain-related irritability affecting others.

Etiological Theories of Bruxism

There are two main etiological models of bruxism: (1) a centrally mediated theory that views bruxism as a sleep-related disturbance and (2) a local, mechanical theory hypothesizing that occlusal interferences predispose an individual to brux.

The view that bruxism is a sleep-related disorder (parasomnia) was first proposed by Broughton (1968), and multiple studies since that time have confirmed his primary hypothesis. Sleep bruxism typically occurs during stage 2 sleep (the most common sleep stage), REM sleep, and in the transition from deeper to shallower levels of sleep. Although there are differences in the microstructure of sleep between sleep bruxists and normal controls, the macrostructure is similar between the two groups, and sleep bruxers often report good sleep.

Individuals who engage in sleep bruxism appear to be more sensitive to the effects of micro-arousals. In one study (Kato et al., 2003), polygraphic recordings were taken from eight

bruxists and eight matched controls. While sleeping, vibrotactile or auditory stimuli were used to induce arousal without causing awakening. All of the individuals with sleep bruxism but only one of the nonbruxism controls responded to the presentation of the stimuli with RMMA.

A sleep bruxism episode involves a cascade of physiological events starting well before the onset of RMMA and tooth grinding (Lavigne et al., 2007). Sympathetic-cardiac tone increases 4–8 minutes before an episode of RMMA. Increased EEG activity occurs four seconds before RMMA, and heart rate increases one second before RMMA. The suprahyoid muscle shows increased activity 0.8 seconds before the onset of RMMA and tooth grinding. The evidence suggests that the motor cortex is not solely responsible for sleep bruxism and that systems controlling autonomic and cardiac functioning play a significant role in sleep bruxism.

The alternative viewpoint focuses most intensely on occlusal variables. In this model, high restorations and other local irritants, malocclusions, or traumas induce the nervous system to engage in sleep bruxism. When the local irritant is removed, bruxism will then cease. The logical implication of this perspective has led dentists to perform occlusal adjustments in an attempt to remove occlusal disharmonies and eliminate sleep bruxism.

Evidence for this perspective is mixed. Deliberate creation of occlusal disharmonies is generally well tolerated in both sleep bruxing and nonbruxing patients. Sleep bruxism may be associated with Class II and III occlusions, deep bite, overjets, or artificial contacts between posterior teeth (e.g., Sugimoto et al., 2011). However, the ability to predict or modify nocturnal grinding from occlusal contacts has not received consistent support in the scientific literature (Lobbezoo et al., 2012).

Several mechanisms (Glaros, 2008) have been proposed for the persistence of awake bruxism (i.e., tooth contact) in spite of its painful consequences. One perspective considers tooth

contact to be an adjunctive behavior, that is, a behavior (e.g., clenching) that occurs close in time to another behavior that is formally reinforced. Adjunctive behaviors are sometimes characterized as stereotyped, irrelevant, or out of context, a reasonable description for a behavior that can occur as often as 40% in normal controls and more than 70% of the time in those diagnosed with the myofascial pain of temporomandibular disorders (Glaros et al., 2005). Alternatively, individuals who engage in awake bruxism may have deficits in their ability to accurately report on the activity of their masticatory muscles (Glaros, 1996), leading individuals to be functionally unaware of their behaviors.

The role of psychosocial stressors and personality variables in sleep and awake bruxism is complex. The relationship appears to be weak in those who engage in sleep bruxism but stronger in those who engage in awake bruxism (Manfredini & Lobbezoo, 2009). Personality studies of sleep bruxers suggest that they are anxious and tense (Restrepo et al., 2008). They may also have a higher level of perceived stress and have an inability to deal with these stressors in a positive manner (Giraki et al., 2010). It is difficult to know if these traits are etiologically related to sleep bruxism or whether these traits are a response to the social embarrassment of having significantly eroded teeth and an unattractive smile.

Sleep bruxism has been linked to stress, but like the personality trait studies, it is difficult to know if stress precedes, is coexistent with, or follows bruxism. Studies carried out with mammals suggest that the deliberate creation of occlusal disharmonies can increase plasma and urinary cortisol levels associated with stress and central catecholaminergic activity (Areso et al., 1999). Significantly higher levels of urinary catecholamines are found in individuals with sleep bruxism (Seraidarian et al., 2009). In adults, exposure to psychological stress increases salivary levels of chromogranin A, a biomarker for emotional stress, in those with sleep bruxism but not in those without sleep

bruxism (Abekura et al., 2011). Investigators have also suggested that nonfunctional masticatory activity, such as sleep bruxism, is a stress-control mechanism affecting central catecholaminergic neurotransmission (Gomez et al., 1999).

Individuals who engage in awake bruxism and experience myofascial or TMJ pain from their behaviors often show higher levels of psychological distress than those who do not engage in this behavior. Individuals who engage in chronic, painful awake bruxism often report higher levels of somatoform disorders (particularly pain disorder), mood disorders (typically involving depression), or anxiety disorders (Giannakopoulos et al., 2010; Manfredini et al., 2010). However, the distribution of emotional distress can vary significantly across those who engage in awake bruxism, with some individuals showing considerable psychological dysfunction and others showing little emotional distress. These findings suggest clinicians should be open to the possibility that those with awake bruxism have significant emotional distress, but they should not expect such distress to be definitely present in all who engage in awake bruxism.

Diagnosis

The “gold standard” for the diagnosis of sleep bruxism is sleep polysomnography. As measured by sleep electromyographic (EMG) recordings, at least two distinctly different nonfunctional behaviors occur during sleep: (1) high amplitude, brief rhythmic EMG bursts (RMMA) that can vary in total duration (Lavigne et al., 2001a) (see Fig. 11.2), and (2) arrhythmic, high amplitude activity, typically of short duration. Spontaneous rhythmic activity occurs in a large percentage of the normal population (60%); patients with sleep bruxism show more frequent episodes and more bursts of activity within an episode (Lavigne et al., 2001a).

The presence of RMMA is a necessary but not sufficient criterion for making a formal diagno-



Fig. 11.2. Electromyographic trace of rhythmic masticatory muscle activity during sleep bruxism. Reprinted from Gilles et al. (2007) “Genesis of sleep bruxism: motor and autonomic-cardiac interactions,” *Archives of Oral Biology*, 52, 381–84, with permission from Elsevier.

sis of sleep bruxism. Participants in a sleep study must also have detectable grinding sounds or preferably, video-based evidence of grinding during sleep. Grinding sounds, as reported by the patient, bed partner, or parents (in the case of children), should also be present. Evidence of unusual tooth wear indicative of tooth grinding is not a reliable diagnostic indicator, since the damage may be due to prior sleep grinding.

An alternative to polysomnography is the Bruxcore bruxism-monitoring device (BBMD), fabricated from four thin layers of colored plastic laminated to a total thickness of 0.02 inches, with microdots printed on the top surface. The dots are 1/180 inch in diameter, and 1 square inch contains 14,400 dots. The plastic is molded into a mouth guard and worn at night. As grinding occurs, the microdots on the top surface are worn away. Severe grinding can expose colored layers underneath the top, white surface. The severity of grinding can be computed as the number of dots or pixels missing, multiplied by the color of any exposed layer. For example, the number of missing dots or pixels on the top layer are summed and multiplied by one, the number of missing dots that expose the next layer (red) are counted and multiplied by three, and so forth, for a maximum multiplier of 8 when the lowest layer

is perforated. The total score reflects the severity of grinding. Using a pixel score cutoff point of 2900, the BBMD has a sensitivity of 79.2% and a specificity of 95.2% (Ommerborn et al., 2005).

Excessive attrition of the teeth is often used as *prima facie* evidence of sleep bruxism. Unfortunately, attrition is a historical record and may not be reliable as evidence of current sleep bruxism. A report from bed partners of rhythmic tooth noises that occur during sleep may signify ongoing grinding. Some evidence has suggested that sleep bruxism is associated with a higher incidence of mandibular tori (Kerdpon & Sirirungrojying, 1999). Advances in miniaturization of electronic instruments have led to the development of nighttime monitoring devices to detect sleep bruxism (e.g., Amemori et al., 2001; Shochat et al., 2007). A variety of devices are available for purchase, but their operation, user-friendliness, and ability to distinguish clenching from grinding can vary substantially.

No “gold standard” exists for the diagnosis of awake bruxism. Most studies rely on self-report of daytime clenching to assess awake bruxism, and the methodology for collecting these self-report data can be very sophisticated (Glaros et al., 2005). EMG recordings of the masseter or temporalis muscles have also been used successfully to distinguish groups of individuals with awake bruxism from those without this disorder (Chen et al., 2007). The painful consequences of awake bruxism (i.e., masticatory muscle and TMJ pain) can be diagnosed reliably, but there is no standard for differentiating between those with, or without awake bruxism based on either self-report or daytime EMG recordings.

Due to the diversity of behaviors and their occurrence during the sleep/wake cycle of an individual, providers must utilize multiple sources of information to properly diagnose the disorders. Evidence of sleep bruxism may take several forms (e.g., attrition, noise), and evidence of awake bruxism may take different forms (e.g., pain, stiffness). Various medications may be implicated in the onset or exacerbation

of sleep bruxism. These include methamphetamine as a treatment for attention deficit hyperactivity disorder (Gara & Roberts, 2000), supplemental serotonin reuptake inhibitors for depression (Lobbezoo et al., 2001), and multi-drug use or withdrawal from drugs among drug addicts (Winocur et al., 2001). Individuals with various dystonias and genetic disorders (e.g., Rett syndrome) may report high levels of sleep or awake bruxism. A thorough evaluation of a bruxing patient therefore requires inquiry into both nondental and dental domains.

Treatment

There is broad consensus that mouth guards (also known as splints) are a safe and effective treatment for limiting the attrition to teeth caused by sleep bruxism (Macedo et al., 2007). There is considerably less consensus on how the mouth guard should be constructed: Mouth guards can be made from acrylic and considerably softer materials. They can cover the maxillary or mandibular teeth. The guards can present a relatively flat plane to the opposing dentition or may be designed to place the teeth and jaws into a specific occlusal pattern. Splints that provide no tooth coverage whatsoever can also produce improvement (Dubé et al., 2004). In any case, the evidence in favor of a particular design or material is either of poor quality or inconsistent.

There is no clear evidence that splints permanently or temporarily reduce sleep bruxism (Macedo et al., 2007). Clinicians should therefore view the use of mouth guards as strictly preventive (with respect to tooth damage), not curative. Few studies on the long-term effects of splints have been carried out. Long-term use of oral appliances that do not permit contact with the opposing occlusion can create severe and irreversible complications. Patients should therefore be monitored closely for signs of untoward changes.

Alarm systems may be used as alternatives to mouth guards. These devices typically

monitor masseter EMG activity (or noises produced during grinding) while a patient sleeps. When EMG activity exceeds a threshold for a specified length of time, an alarm sounds. Generally, the alarm continues until the patient actively terminates the alarm.

Alarm systems can reduce the frequency and intensity of sleep bruxism while the alarm is in use (Cassisi, McGlynn, & Belles, 1987). Removal of the device often results in a return of bruxing behaviors and may even produce a rebound in which bruxing behaviors occur at a higher rate than at baseline. Monitoring EMG activity requires placement of surface electrodes on the face. Patients may not be reliable in their technique for preparing the skin or for placing the electrodes in the proper location. Surface electrodes are relatively small, but they can be a source of discomfort when patients sleep on their sides.

Several other approaches have been used to treat sleep bruxism. One device generates non-painful electrical stimulation to the face when sleep bruxism occurs (Jadidi, Castrillon, & Svensson, 2008). Trials on the efficacy of this approach suggest that it can reduce EMG activity occurring at night without disrupting sleep. Another device uses taste aversion to reduce sleep bruxism (Nissani, 2000). In this approach, a removable wire-frame appliance is fabricated with liquid-filled capsules installed in the area of the molars. The capsules are filled with a mildly noxious liquid. When a patient exerts pressure on the capsules, they break open, spilling the liquid into the mouth, waking the subject, and ending the oral parafunction.

Pharmacologic approaches to the treatment of bruxism are appearing with increased frequency. Perhaps the most common pharmacologic approach involves botulinum toxin (Botox) injections. Several trials (e.g., Lee et al., 2010) suggest that botulinum toxin injections can reduce sleep bruxism. The treatment effect reported in trials is most likely due to reduction in muscle activity rather than a change in CNS activity. Accordingly, the long-term effective-

ness of botulinum toxin injections remains unknown.

Several other drugs have been tested as treatment for bruxism (e.g., amitriptyline (Raigrodski et al., 2001); bromocriptine (Lavigne et al., 2001b)), but none has yet emerged as a consistently effective alternative to mouth guards. One innovative approach investigated the effects of propranolol and clonidine on sleep bruxism (Huynh et al., 2006), based on their hypothesized ability to prevent the increase in sympathetic activity that occurs prior to sleep bruxism. The results showed greater efficacy for clonidine, although nearly 20% of those taking this drug experienced significant side effects.

Occlusal equilibration and other occlusal therapies have been utilized as permanent treatments for bruxism and myofascial pain. It is common for nonblinded treatments to report considerable success with this approach. However, more controlled trials show no particular benefit to occlusal adjustments as a treatment for sleep bruxism (List & Axelsson, 2010).

For awake bruxism, investigators have examined multiple techniques to control awake bruxism directly or to reduce the pain associated with high levels of daytime tooth contact. Techniques that show efficacy for managing awake bruxism-associated pain include biofeedback-assisted relaxation (Crider, Glaros, & Gevirtz, 2005), cognitive-behavioral interventions (Aggarwal et al., 2011), and self-regulation approaches (Sauer, Burris, & Carlson, 2010). Splints can also be used to reduce pain.

Habit reversal training has also been used successfully to treat awake bruxism. In habit reversal training, clinicians teach patients to become more aware of an undesired behavior (i.e., high levels of tooth contact or masticatory muscle "bracing"), develop an alternative behavior (reduction of masticatory muscle activity leading to reduced tooth contact), and substitute the alternative behavior for the undesired behavior. Evidence suggests that habit reversal can be effective in reducing pain and that the degree of pain relief is directly related

to the degree of change in awake bruxing behaviors (Glaros, Owais, & Lausten, 2007).

Summary

Bruxism consists of at least two different varieties: one occurring during sleep, and the other occurring during wakefulness. These behaviors can begin in early childhood and last throughout adulthood. It is a relatively common disorder affecting 8% or slightly more of the adult population. The most common effect of sleep bruxism is tooth wear. There is good evidence that bruxism is a sleep-related disorder; the evidence favoring an occlusal approach to this disorder is considerably weaker. The etiology of awake bruxism is less well established, although the automatic, unconscious nature of awake bruxism may be due to a reinforcement process producing adjunctive behaviors.

Occlusal wear may be evidence of sleep bruxism, but polysomnographic studies are the "gold standard" for diagnosis. Unfortunately, polysomnography is both expensive and time-consuming, while attrition is a historical record of wear and not evidence that bruxism is currently a problem. Assessment of awake bruxism relies heavily on self-report, and technological approaches to the assessment of awake bruxism are developing rapidly. A thorough evaluation of a patient suspected of having sleep or awake bruxism must include domains other than dentistry.

Treatment via splint therapy is primarily designed to prevent damage to the teeth produced by sleep bruxism or to reduce pain associated with awake bruxism. Other approaches, including nocturnal alarms and medications, may temporarily reduce sleep bruxism. There are no dental, behavioral, or pharmacological treatments that permanently eliminate sleep bruxism. Awake bruxism and its associated pain appear to respond well to a variety of behavioral techniques, including biofeedback-based relaxation, cognitive-behavioral treatment, self-regulation training, and habit reversal.

Considerably more work needs to be done to identify the behavioral and biological mechanisms that influence, and are influenced by, the different forms of bruxism. Similarly, more work needs to be carried out to develop and test interventions that reduce and eliminate bruxing behaviors. By their nature, studies of bruxists can be difficult to conduct, especially when sleep recordings are required from patients. However, work carried out in this area provides an excellent example of the ways in which the knowledge and expertise of nondental professionals contribute substantially to our understanding of these common and complex disorders and improve treatment outcomes.

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12

Dental Fear and Anxiety Associated with Oral Health Care: Conceptual and Clinical Issues

Daniel W. McNeil and Cameron L. Randall

Key points

- Dental care-related fear and anxiety are related but distinct states that exist on continua and influence how and when a patient utilizes dental treatment.
- Fears and anxieties about dental treatment can develop via a number of mechanisms and manifest in diverse ways; they are highly individualized, complex phenomena which in extreme forms can meet criteria for Specific Phobia.
- Dental care-related fear and anxiety are prevalent global public health concerns that impact oral health, systemic health, psychological/emotional health, and quality of life.
- Appropriate and comprehensive assessment of dental care-related fear and anxiety is critical for understanding an individual patient's experience, and necessary for successful reduction of the aversive states.
- A number of intervention strategies are available, including behaviorally, cognitively, educationally, and pharmacologically oriented methods, which can be used singly, or in combination, for effectively working with highly fearful and anxious patients.

Introduction

Fear, anxiety, worry, nervousness, and even disgust associated with the dental environment and oral healthcare professionals are global and ubiquitous phenomena that impact a diverse range of patients across the life span, with impact on family, friends, coworkers, and oral health professionals. This chapter focuses on dental anxiety and fear in adults and adolescents; these phenomena in children are of critical importance, given their developmental course and natural history from childhood leading into adulthood. Chapter 14 in this volume provides information about disruptive behavior in children in the dental operator and its relation to fear and anxiety. So commonplace are the experiences of dental anxiety and fear, in fact, that they frequently are the topics of advertisements, newspaper cartoons, stand-up comedy routines, and everyday conversations (e.g., Sonis, 1997). While it may be a common experience, and even the focus of countless jokes, dental fear and anxiety are distressing, if not debilitating, over decades, for many patients, and are of significant clinical relevance for the dental professional. Dental fear and anxiety about dental care can be daunting barriers to the utilization of treatment.

Recognized as somewhat separate states that exist along continua in the general population, dental fear and anxiety may be so extreme that the patient can be diagnosed with a Specific Phobia, or a related behavioral health problem. While highly dental-anxious/fearful patients can be placed into general categories, there are innumerable unique manifestations. In spite of advancing dental treatment technologies, dental fear and anxiety appear to be at static levels from a population-wide perspective. Across the globe, dental fear and anxiety are associated with avoidance of oral health care, and so may best be conceptualized as *dental care-related fear and anxiety*. The avoidance behavior is linked to greater oral disease and poorer oral health-related quality of life, with implications for systemic health and quality of life in general,

and is therefore a major public health problem worldwide. Understanding dental care-related fear and anxiety from both conceptual and clinical standpoints is critical for the oral healthcare professional. Appreciation of conceptual issues will inform assessment, management, and treatment of patients with high levels of dental care-related fear and anxiety.

Conceptual Considerations

Dental treatment is a potentially stressful experience for many, even most patients. Physical (e.g., potential for pain, being closed-in) and environmental/psychological factors (e.g., lack of predictability, loss of control) make the dental situation unique and often invoke stress (Eli, 1992). Undoubtedly, some procedures are especially stressful for a great majority of patients. For example, in patients generally (i.e., not necessarily those who are highly fearful/anxious), root canal therapy and the associated pain and stress results in transitionary changes in natural killer cell cytotoxicity and the subsequent development of infectious disease episodes within the following month (Logan et al., 2001).

Patients experience fear or anxiety not only during invasive procedures; in fact, patients also report experiencing fear and/or anxiety in the context of routine preventative procedures, including dental hygiene treatment (Gadbury-Amyot et al., 1996; Sullivan & Neish, 1998). Many aspects of dental treatment are perceived as uncomfortable, threatening, or disgusting by patients, including the sights, sounds, and smells associated with the dental clinic, injections, dental instruments, perceived lack of control and predictability, and dental/orofacial pain (McNeil & Berryman, 1989; de Jongh et al., 1994; Johnsen et al., 2003). Moreover, patients often feel embarrassment in regard to their anxious and fearful responses anticipating, or while receiving, dental care.

The terms “oral health care” and “dental treatment” are quite broad, and so elucidating what aspects of the general construct are emo-

tionally evocative is important in defining the “universe” of what constitutes dental fear, anxiety, and phobia. Indeed, dental fear can be quite specific, as in the case of an otherwise generally comfortable patient who becomes in need of root canal therapy, or it can be generalized to almost all aspects of treatment, and can be part of another syndrome such as panic disorder with agoraphobia (although situationally bound panic attacks can occur in the context of a Specific Phobia of dental care). Injection fear is one important and common specific type of dental care-related fear (Milgrom et al., 1997). It can be highly circumscribed and encapsulated, but also is present in many (but not all) forms of dental fear and phobia. It can be restricted to oral injections, although it can be part of fear about injections in any part of the body. Many patients who experience injection fear also suffer from fears about other aspects of dental care. Given the nature of dental care, Blood-Injection-Injury (BII) Phobia can be provoked during oral health care. While there is some overlap clinically, particularly in terms of injection fears, research suggests that dental phobia is best conceptualized as a Situational Type of Specific Phobia, independent of the BII Type (de Jongh et al., 1998). Nevertheless, the Diagnostic and Statistical Manual of Mental Disorders-Fifth Edition (DSM-5; American Psychiatric Association [APA], 2013) seems to require the classification of Dental Phobia as a Specific Phobia with a blood-injection-injury code, which the DSM-5 text suggests is uniquely associated with vasovagal syncope, which certainly is not the case for many or most individuals with dental phobia. This change from the earlier edition of the DSM adds confusion to the literature, in that some authors have assumed or suggested individuals with dental phobia *all* should be classified with the BII Type. There is evidence to the contrary, however, supporting the notion that the Situational Type is the most common form of Specific Dental Care-Related Phobia (de Jongh et al., 1998; Leutgeb, Schäfer, & Schienle, 2011), although some individuals certainly would fit the criteria for BII Phobia.

In general, patients fear aspects of professional oral health care, with a few having anxiety or fear about self-care (e.g., toothbrushing). Evocative aspects of dental care are specific dental stimuli and experiences, such as being supine in the dental chair; pain, anticipation of pain, or memory of pain; sight and sound of the drill; and receiving injections, along with environmental factors, such as the lack of predictability and control, inability to easily “escape” or leave the dental setting, and (largely perceived) potential for infection.

Though dental patients may report both *fear* and *anxiety* about dental treatment, it is important to note that the two are phenomena that indeed are distinct from one another, although there likely is some overlap between them (McNeil et al., 1993; Poulton et al., 2001). This distinction between dental care-related fears and anxieties, as noted by Poulton et al. (2001) and Thomson et al. (2009), is one in need of further clarification and investigation. Many of the titles of current dental fear and anxiety instruments, as well as those evaluating fears and anxieties about pain, are misnomers, in that they purport to assess anxiety or fear, but in reality likely reflect some combination of both states.

Broadly speaking, dental care-related *fear* is a distressing emotional response to treatment-related stimuli, typically characterized by physiological responsivity, feelings and reports of apprehension and/or dismay, and avoidance. The fear literature suggests that it is a robust emotion, almost always defined by immediate onset, which usually involves a salient physiological component (e.g., Craske, 2003). A severe fear response may involve panic symptoms or even a panic attack in the dental clinic. Components that predispose a patient to panic attack are (a) an inability to escape easily; (b) a reduction in controllability; and (c) a reduction in predictability.

Dental care-related *anxiety*, though akin to dental care-related fear, is a more cognitively involved emotional response to stimuli or experiences associated with dental treatment.

Generally, anxiety entails negative thoughts and worries, and with respect to exposure to evocative stimuli, often occurs distally in time (Craske, 2003). That is, dental patients are most likely to experience anxiety well prior to their dental visit as they consider elements of the dental visit that have caused or could cause discomfort, and this anxiety may wax and wane between appointments. Dental patients are most likely to experience fear immediately prior to and during the visit as they are exposed to “threatening” stimuli. At some point, there likely is even a mixture of anxiety *and* fear for some patients. Understanding the patient’s “nervous” behavior as anxiety, fear, or a combination of the two is a crucial first step in determining strategies for intervention that will be most efficacious for improving the patient experience.

Fear and anxiety no longer are considered binary phenomena, as people do not fit neatly into “fearful” or “nonfearful” groups. Instead, fear and anxiety can be more accurately conceptualized as dimensional in nature. Contemporary models of both fear and anxiety suggest that each construct exists on a continuum (McNeil et al., 2012b). At one end of the continua, a patient may essentially have complete lack of treatment-related fear or anxiety. At the other end, a patient may have such extreme fear or anxiety that his or her symptoms are consistent with DSM criteria (e.g., APA, 2013) for Specific Phobia or another (likely anxiety) disorder. Between the two ends of the continua, there

exists a range of situation-specific dental care-related fear or anxiety experiences, including those that are “normal,” those that involve only seldom and insignificant fear/anxiety behaviors, and those that involve more frequent or impairing fear/anxiety behaviors or complete avoidance. Along these spectra are patients who hate visiting the dentist, but nonetheless are able to attend appointments; that is, they experience and report fear, but do not avoid (entirely). A model of the dental fear/anxiety continua is illustrated in Figure 12.1. Considering the dental care-related fear and/or anxiety experience in this way allows clinicians to interact with patients in an individualized manner, tailoring patient management approaches to be appropriate and effective for reducing the situation-specific, idiosyncratic, and dynamic fear or anxiety experience.

Etiology of Dental Care-Related Fear and Anxiety

A number of mechanisms have been proposed in order to describe the development, maintenance, and life-course of dental care-related fear and anxiety. Once thought to have direct antecedents almost always in childhood, dental care-related anxiety and fear can appear at various stages across the life span (Milgrom et al., 1988; Locker et al., 1999b; Thomson et al., 2009), although childhood onset nevertheless is the most common. While a full review of each of these hypotheses is beyond the scope of this

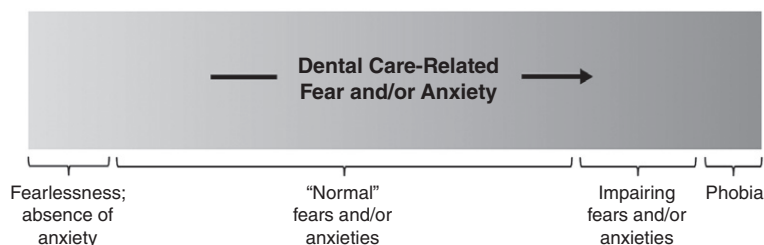


Fig. 12.1. Model of the continua of dental care-related anxiety and dental care-related fear across the general population.

chapter, a basic examination of the major ideas will shed some light on the complex phenomena. In trying to discern the determinants of dental fear and anxiety, it is important to be cognizant that human behavior is multidetermined; it is unlikely that there is "one" factor that predisposes or produces dental anxiety or fear. It also is critical to consider whether one is trying to predict dental anxiety/fear across an entire population as a whole (including the entire continua of dental anxiety and dental fear) or for a subpopulation (e.g., persons with high dental anxiety and/or fear, people who are dental avoidant); the larger the constituent group, the more likely that factors which affect only particular subgroups will be submerged in statistical analyses and that individual difference factors will be overlooked.

Conditioning

Dental care-related fear and anxiety may, for many patients, be conditioned via prior exposure to painful or traumatic dental experiences (Weiner & Sheehan, 1990). Fear or anxiety responses may, through classical conditioning, form and be strengthened when an association is made between dental treatment-related stimuli and aversive experiences such as pain, discomfort, or lack of control (Kent, 1985; Davey, 1989). A classic example reveals how a patient may develop a fear of the dentist or dental care-related stimuli: A tooth restoration that involves pain, accompanied by the sound of a dental drill and the smell of the dental clinic, reinforces an association between negative physical and emotional states and treatment-related stimuli, making future anxiety or fear responses more likely. When the individual returns to the dental clinic, the drill sound and smells of the office (now "conditioned stimuli") alone provoke fear.

Dental care-related fear or anxiety responses also can be learned and perpetuated through operant conditioning, in which fear or anxiety behaviors (e.g., panic symptoms, crying, squirming, and avoidance) are reinforced, either through positive reinforcement, negative reinforcement, or both. Parents, for example, may

inadvertently use positive reinforcement (essentially encouraging a behavior by doing something that is at least immediately rewarding) by being overly solicitous in response to their child's expressed fears about an upcoming dental appointment, or even agreeing with the child's prediction that it will be "terrible," instead of using distraction, focusing on the child's coping abilities, or other more positive responses. Negative reinforcement (essentially actions that remove some ongoing unpleasant situation) also can promote dental fear. For example, an already highly fearful patient who is in a dental chair, with a procedure about to be performed may squirm, complain of "nervousness," and may have high cardiovascular reactivity. The compassionate dentist might interrupt treatment and suggest the patient come back another day when the patient is feeling "up to" having the procedure. While well intentioned, the dentist's behavior actually negatively reinforces fear by removing the immediate "threat" of the procedure, delaying it until some indeterminate future time. (What might be a better strategy would be to complete at least part of the treatment, to avoid reinforcing fear behavior, and to give the patient the sense of self-efficacy in completing some dental treatment. Alternately, preventing or reducing the fear through behavioral and/or pharmacological means also might be ideal.)

This latter example not only portrays negative reinforcement, but exemplifies how Mowrer's (1939) two-factor theory of learning extends the conditioning hypotheses of the development of dental care-related fear and anxiety to explain the maintenance of the phenomena and the related treatment avoidance behavior. First, fear is conditioned to environmental cues, such as the sights, sounds, and smells of the dental office, and that conditioned fear motivates the person to leave the office (i.e., "escape"). Second, if the patient does indeed leave the office, perhaps with the encouragement of the dentist, then getting away from the cues of the dental environment counterintuitively reinforces dental fear, which will make it

more difficult for the patient to return in the future. According to this theory, conditioned fear and anxiety are maintained as a result of subsequent avoidance of treatment since avoidance permits the learned association between dental treatment-related stimuli and negative physical and emotional states to remain strong, as no opportunities to learn otherwise (i.e., that not *all* dental experiences are negative) are afforded to the patient. With treatment avoidance added to the mix, a “vicious cycle of dental fear” only exacerbates the learned fearful and anxious responses to dental treatment. Patients in such a cycle suffer from dental care-related anxiety and fear, which results in delayed dental visit attendance patterns, which yield more dental problems, thus producing symptom-driven treatment-seeking patterns (and, as a result, more painful dental treatment experiences), ultimately reinforcing the conditioned dental care-related fear or anxiety (see Weinstein, 1990; Armfield, Stewart, & Spencer, 2007).

The conditioned or learned association between previous dental trauma and dental care-related fear and anxiety may be rather specific. That is, dental care-related fear and anxiety may be unrelated to most other types of trauma. With regard to previous traumatic experiences that are not dentally related (e.g., tragic death of a loved one, violent crime, natural disaster, war), no definitive association has been found between trauma and dental care-related fear and/or anxiety (Oosterink, de Jongh, & Aartman, 2009a; Humphris & King, 2011). Nevertheless, an association has been found between previous sexual trauma (i.e., sexual assault) and dental care-related anxiety (Humphris & King, 2011).

Traumatic conditioning is regarded as neither necessary nor sufficient to describe the etiology of all fears and phobias (Mineka & Sutton, 2006). Instead, observational/vicarious learning and verbal/instructional learning also can play a role as pathways in the development and maintenance of a fear or phobia (Rachman, 1977, 1990). There is strong evidence that such a contemporary conditioning model can be

applied to dental phobias and dental care-related anxiety (see Davey, 1989). Through experience and association, patients learn to be fearful of dental treatment, dental professionals, and the dental situation. Individual differences in dental fear or anxiety conditioning are the result of both differences in experience and, quite importantly, genetic/biological differences that differentially predispose individuals to develop and maintain the fears or anxieties. Notably, patients may not be able to recall a traumatic dental visit that played some role in the development of dental care-related fear and/or anxiety even if it occurred; it is well known that accuracy of recall of events, even some salient ones, is sometimes poor (see Mineka & Sutton, 2006). Just because a patient does not remember a traumatic dental visit does not mean there has not been fear conditioning as a result of a painful or uncomfortable previous experience. Some patients with a history of traumatic dental visits and associated dental care-related fear and/or anxiety simply may not be able to remember such visits, as the memories may be forgotten, repressed, or otherwise so emotionally laden that trying to recall them is cognitively blocked.

Social Learning

Some dental patients are fearful of dental treatment, the dental clinic, or oral healthcare providers even though they never have encountered a painful or negative experience (Milgrom, Weinstein, & Heaton, 2009). Perhaps their fears and anxieties about the dental situation have been transmitted to them via social or observational learning, or directly shared information. In such routes of anxiety/fear acquisition, people learn that dental treatment is uncomfortable, distressing, or painful via witnessing emotional arousal in others, information sharing (e.g., “Getting your wisdom teeth out really hurts!”), and/or otherwise hearing stories from parents, friends, others, or mass entertainment or media outlets. While such patients may never have had a negative dental experience themselves, they may learn from others that dental

care is threatening; therefore, the experience, or anticipation of it, may become fear- or anxiety-inducing. For example, a patient may be informed that she needs root canal therapy and, in response, demonstrates a strong fear reaction and perhaps even a desire to instead get an extraction, due to her negative perceptions of endodontic care, learned from the popular media (to which she has been exposed from an early age).

Vicarious dental care-related anxiety and fear has been documented in children, who likely learn to be fearful or anxious from parents or siblings (Melamed & Williamson, 1991). There is, in fact, evidence that parents' dental care-related fear and fear-driven dental avoidance behavior is predictive of their adolescents' fear and avoidance behavior (McNeil et al., 2013a). Intergenerational transmission of dental care-related fear and anxiety likely is, at least in part, the result of observational learning. Dental professionals, when assessing dental care-related fear and anxiety and treating fearful or anxious patients, should not assume that previous, personally experienced dental trauma exists or that socially learned fears and anxieties are any less intense or impairing than fears and anxieties that developed by way of other mechanisms. Social and observational learning can have a great impact, and in some patients, may be the primary etiological factor in the development and maintenance of dental care-related anxiety and fear.

Biological Influences

It is important to note that biological factors can have a part in the development and maintenance of dental care-related fear and anxiety in some individuals, or may be protective factors in others. Consistent with contemporary thought in psychology and behavioral neuroscience, individual biological and genetic factors can be seen as predisposing certain patients to be more or less likely to develop dental care-related fear and/or anxiety and/or other forms of psychopathology. Essentially, genetic differences make some patients more susceptible

than others to develop fears and/or anxieties through the learning-, cognitive-, personality-, and/or pain-based etiological mechanisms. Though there is a limited literature on the role of genetics and other biological factors in the etiology of dental care-related fear and anxiety, initial work suggests that they may serve as a diathesis (or vulnerability) for the development and/or maintenance of high levels of fear and anxiety.

The vulnerability may be more general, such as with neuroticism, which is a fairly heritable trait, and one that is associated with dental care-related anxiety (Vassend, Roysamb, & Nielsen, 2011). Or, the risk may be more specific, such as a predisposition to pain sensitivity and/or local anesthetic insensitivity, which is related to a genetic variation (Binkley et al., 2009). At present, this preliminary literature suggests that dental care-related fear is heritable (e.g., Ray et al., 2010; Randall et al., 2012), with the suggestion that biologically, dental care-related fear is intimately tied to fear of pain (Randall et al., 2012).

Cognitive Factors

For many fearful or anxious dental patients, cognitions play a key part in their experience; misperceptions, negative thoughts, and patterns of thinking that include worries about danger or lack of control are common in individuals with anxiety disorders. Patients with greater levels of dental care-related fear and anxiety often engage in catastrophizing or misappraising dental treatment as more dangerous than it is, overestimating the likelihood of negative outcomes that may result from dental treatment. Such cognitions, if frequent and severe enough, produce a particularly negative response to dental treatment. Some categories of misperceptions which often predict patient anxiety/fear include uncontrollability, unpredictability, dangerousness, and disgustingness (Armfield, 2010c). In general, catastrophizing and lack of cognitive control are critical moderators of dental care-related anxiety and fear (de Jongh et al., 1994). Current cognitive models

of dental care-related fear suggest that abnormal fear may be acquired through a cognitive vulnerability, whereby a pattern of thinking that involves consistent misperceptions of stimuli as overly threatening yields the development of clinically significant levels of dental care-related fear and anxiety (Armfield, 2006). This cognitive vulnerability likely is the result of previous experiences and a genetic/biological predisposition that interacts with the environment. Understanding how a patient perceives all aspects of the dental treatment experience, encouraging realistic and appropriate appraisals, and correcting misperceptions when necessary, may be a critical aspect of anxiety/fear reduction for some patients. If these individuals view the dental treatment experience more accurately, they may be less likely to perceive relatively neutral stimuli or occurrences as threatening or traumatic and therefore will be less likely to develop fears or anxieties related to dental treatment.

Beliefs about dental treatment generally, and providers specifically, are important in understanding the development and maintenance of dental care-related fear and anxiety for some dental patients (Milgrom et al., 2009). Cognitions related to the appraisal of dental professionals and the dental profession may make an individual patient more or less likely to be fearful of or anxious about dental treatment; negative beliefs about dental treatment and unfavorable attitudes toward dental professionals are strongly correlated with dental care-related anxiety/fear (Doerr et al., 1998). Beliefs that affect dental care-related fear and anxiety and impact treatment-seeking patterns generally center on attitudes of trust/distrust, judgments about dentist-patient communication, and desire for control (Abrahamsson, Ohrn, & Hakeberg, 2009).

Beliefs about predictability and control in the dental situation can be important elements of dental care-related fear and anxiety. For some patients in particular, perceived lack of control may be an especially critical variable when considering the etiology of the fear and/or anxiety.

For example, patients who have a high desire for control and low perceived control in the dental situation report the highest degrees of dental care-related anxiety and distress, a finding that is observed when patients anticipate dental care that is either imminent or not immediate (Logan et al., 1991). Women, as a group, have a greater desire for control as well as a more profound perception of lack-of-control in dental settings, relative to men, who have less desire for control and sense less lack-of-control in that setting (Liddell & Locker, 1997). Similarly, younger adults desire more control and perceive a lesser degree of control during dental treatment than do older adults (Liddell & Locker, 1997). The *desire* for control and the *perception* of lack of control, then, are cognitions that can partially account for dental care-related fear and anxiety in some people.

Personality

Many decades ago, mental health professionals utilizing a psychodynamic framework suggested that dental care-related fear and anxiety was the manifestation of specific unconscious drives/motivations and unresolved internal conflicts. Without significant evidence for those claims, the approach changed, to postulate that personality factors (i.e., stable, consistent, and predictable behavior patterns), broadly, were important to understanding the etiology of dental care-related fear and anxiety. Nevertheless, early work in approaching these problems from a personality perspective was not particularly useful in terms of understanding the specific etiologies of dental care-related fear and anxiety, or in devising efficient assessment and treatment strategies. The focus in the field then shifted to behavior. More recent work utilizing personality assessment in the dental care-related anxiety and fear arena, however, has been more productive. Certain personality traits, such as neuroticism, can predispose individuals to develop and maintain fears or anxieties in general, and/or about dental treatment in particular (Vassend et al., 2011). Contemporary approaches to conceptualizing and assessing

personality in this area have yielded important findings, such as that individuals with stable, long-standing dental care-related anxiety and fear seem to have a mixture of etiological factors, including personality features, such as being easily stressed, experiencing strong negative emotions, and being less sociable with others (Thomson et al., 2009).

Pain-Related Factors

For many patients, dental care-related fear and anxiety has some basis in either pain (i.e., orofacial pain sensitivity) and/or perceptions of or fears about pain. Heightened pain sensitivity may be responsible for the development of dental care-related fear or anxiety in patients who experience objectively similarly painful procedures as other, nonfearful or nonanxious patients (Bernstein, Kleinknecht, & Alexander, 1979; Wardle, 1982). Patients with a lower dental pain threshold and/or tolerance may, through behavioral or conditioning mechanisms, develop impairing dental care-related fear or anxiety as a result of exposure to what would be considered by others to be relatively painless procedures. It may be important for the dental practitioner to identify such patients and to pay particular attention to their comfort level as to limit the opportunities for fear/anxiety conditioning. Interestingly, a number of studies suggest that the experience of dental pain is, to some extent, also dependent on dental care-related fear and/or anxiety; patients with higher levels of fear and/or anxiety report more intense and long-lasting pain during dental injections (e.g., van Wijk & Makkes, 2008; van Wijk & Hoogstraten, 2009) and routine procedures, including scaling (e.g., Sanikop, Agrawal, & Patil, 2011; Tickle et al., 2012). Differential pain sensitivity can be both a precursor to, and the product of, dental care-related fear and anxiety. Relatedly, fear of pain has been found to be an important component of dental care-related anxiety (McNeil & Berryman, 1989; McNeil et al., 2001), and as already noted, these constructs are biologically linked in heritability analyses (Randall et al., 2012). Additionally, fear

of dental pain, specifically, is an important element of dental care-related fear/anxiety (van Wijk & Hoogstraten, 2003). That is, fearing the pain associated with dental treatment (and not necessarily even experiencing painful procedures), may predispose or reinforce fears or anxieties about dental professionals and dental treatment. Being particularly fearful of the *pain* associated with dental treatment, and not the actual treatment per se, can result in avoidance of clinic visits. The interplay of fear of pain, pain sensitivity, and anxiety is complex and important (see Chapter 7, Environmental, Emotional, and Cognitive Determinants of Dental Pain) and should be considered when assessing and treating dental care-related fears and anxieties.

Taken together, these etiological hypotheses highlight the complex nature of dental care-related fear and anxiety. To complicate the situation further, dental care-related fear and anxiety are not necessarily stable traits, as they can fluctuate with time as a result of shorter-term emotional states (i.e., depression), psychosocial factors (e.g., divorce, work-related stress), or as a result of new experiences and/or intervention. Paired with other psychosocial factors, as well as sociodemographic factors, the impact of dental care-related fear and anxiety on patient treatment-seeking behavior can be extreme, even life-threatening, in relation to avoidance of necessary dental care. Figure 12.2 presents a model that accounts for many of the concepts discussed here and provides some organizational context through which to better understand dental care-related fear and anxiety and their relation to utilization of oral health care. There are other models of dental anxiety/fear that focus on the vicious cycle (Weinstein, 1990; Armfield et al., 2007) or on cognitive aspects (Armfield, Slade, & Spencer, 2008). Dental care-related fear and anxiety generally are static, although they can change across the life span, but apparently only in some individuals (Thomson et al., 2009). The variables depicted in the conceptual model may change via dental experience, other life events, or psychosocial intervention.

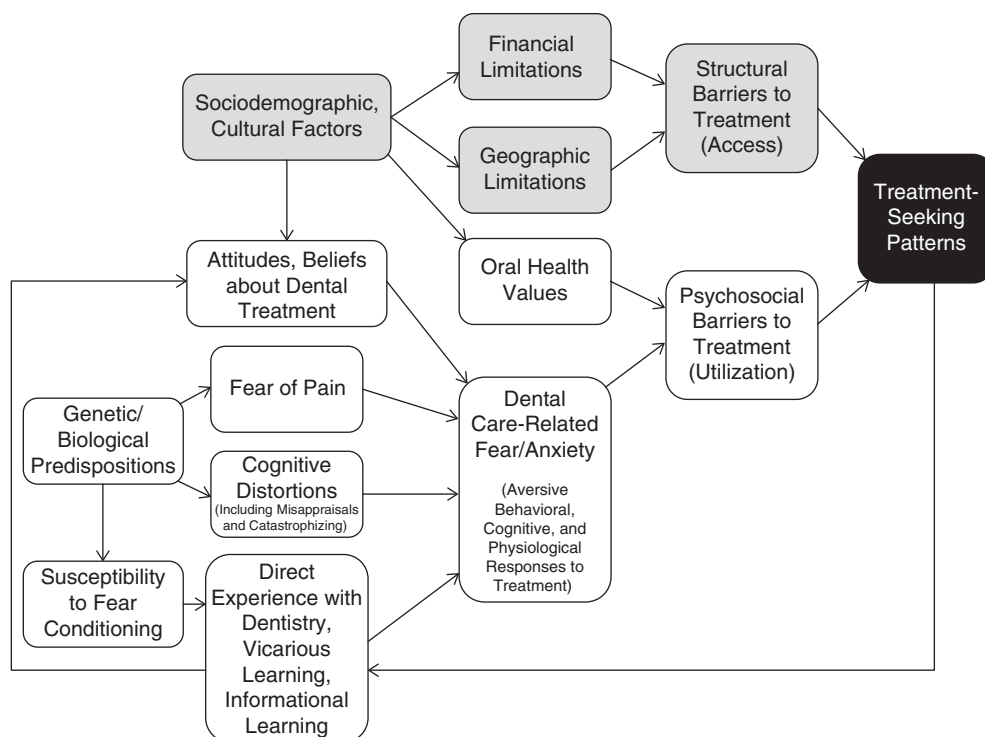


Fig. 12.2. Conceptual model of the impact of dental care-related fear and anxiety on treatment-seeking patterns, and relation to associated variables.

Classification of Patients with Dental Care-Related Fear and Anxiety

Efforts have been made to produce categories based on the etiology and/or manifestation of dental care-related fear and anxiety. One method of classifying people with dental care-related anxiety involves placing the anxious/fearful individual into one of two etiological categories: exogenous or endogenous (Weiner & Sheehan, 1990). Individuals characterized as having exogenous dental care-related anxiety are thought to have developed anxiety/fear as a result of conditioning through traumatic experiences or observational learning, while individuals characterized as having endogenous dental care-related anxiety/fear are thought to have developed dental-specific distress as a result of some other underlying mood or anxiety

disorder. Considering typical ages of onset of dental care-related anxiety/fear, groups with distinct characteristics seem to surface, providing support for an exogenous versus endogenous classification system (Locker et al., 1999b). Across groups, individuals with child-, adolescent-, and adult-onset dental care-related anxiety and fear show similar psychological, behavioral, and cognitive reactions to dental treatment. Nevertheless, a family history of dental care-related distress and traumatic dental experiences (characteristic of exogenous anxiety) is predictive of child-onset dental care-related anxiety/fear, while trait anxiety, multiple fears, and a general hostility and mistrust toward dentists (characteristic of endogenous anxiety) is predictive of adolescent- and adult-onset dental care-related anxiety/fear (Locker et al., 1999b).

Another classification system, one with strong clinical applicability, has been forwarded by Milgrom et al. (1985). Known as the "Seattle System," this method of categorizing patients with dental care-related anxiety and fear places individuals into one of four categories based on the etiology and experienced symptoms of their fear or anxiety: (a) conditioned fear of dental treatment; (b) fear of physiological arousal during dental treatment (e.g., racing heart, panic, fainting); (c) generalized anxiety and/or multiple phobias; or (d) distrust of dentists. The Seattle System is a classification framework that has been evaluated in several fearful and/or phobic samples, with results demonstrating its clinical utility (e.g., Moore, Brodsgaard, & Birn, 1991; Roy-Byrne et al., 1994; Locker, Liddell, & Shapiro, 1999a).

Yet another approach to classification has involved dental patients across the continuum of anxiety and fear. Focusing on fear of pain and its relation to dental care-related anxiety and fear (e.g., McNeil & Berryman, 1989), cluster analytic techniques identified three subgroups of oral surgery patients: (a) high fears of both pain and dental care, (b) high fear of pain but low fear of dental care, and (c) low fears of both pain and dental care (McNeil et al., 2013c).

Finally, using a longitudinal approach, Thomson et al. (2009; Poulton et al., 2001) have identified various trajectories of dental care-related anxiety across three decades of life. Included in this conceptualization are individuals comprising the following trajectories (with percent of the total sample noted in parentheses): (a) stable nonanxious low anxiety (39%), (b) stable nonanxious medium anxiety (38%), (c) adult-onset anxious (8%), (d) recovered (2%), (e) stable anxious (7%), and (f) late-adolescent-onset anxious (6%). Of note is how well this approach maps onto the various child-, adolescent-, and adult-onset types determined by Locker et al. (1999b). Also noteworthy is the very small proportion of individuals who have recovered from problem levels of dental anxiety/fear. This work on the natural history of dental anxiety is of vital importance to the

field, as it is not mired in cutoff scores, and allows a view of the development, as well as maintenance or recovery from, varying levels of dental anxiety across the life span.

Epidemiological Considerations

Both dental care-related fear and anxiety are prevalent phenomena with far-reaching and clinically relevant implications. In the USA, approximately 45% of adults report at least moderate levels of dental care-related fear (Dionne et al., 1998). Between 5% and 10% of the same population indicates that they avoid necessary and accessible dental treatment as a result of this dental care-related anxiety/fear (Milgrom et al., 2009). Similar statistics have been observed in other parts of the world, including Australia (Armfield, Spencer, & Stewart, 2006), Denmark (Moore et al., 1993), India (Kumar et al., 2009), Japan (Domoto et al., 1988), the Netherlands (ten Berge et al., 2002), Singapore (Chellappah et al., 1990), and Sweden (Klingberg, Berggren, & Noren, 1994). Compared to other fears and phobias, dental care-related fear and phobia are common; dental care-related fear ranks the fourth most reported fear, after snakes, heights, and physical injuries, and dental phobia ranks third most prevalent after acrophobia (i.e., fear of heights) and arachnophobia (i.e., fear of spiders; Oosterink, de Jongh, & Hoogstraten, 2009b). When studied in terms of anxiety, versus fear, meta-analysis results suggest that between 10% and 20% of American adults report a high level of dental care-related anxiety (Smith & Heaton, 2003). Though there have been immense improvements in both the quality of and comfort associated with dental treatment, there apparently has been no decrease in the nationwide prevalence of dental care-related anxiety in the USA since the 1950s (Smith & Heaton, 2003).

Dental care-related anxiety/fear is associated with a number of demographic and psychosocial variables. Perhaps most profound are gender differences. There is a consistent finding

across most groups that women report higher levels of dental care-related anxiety/fear and fear of dental pain, and that men report lower levels of such anxieties/fears (e.g., Moore et al., 1993; Liddell & Locker, 1997; Doerr et al., 1998; Craske, 2003; Heft et al., 2007). This finding may be the result of actual gender differences in the experience of dental care-related fear/anxiety or the result of a reporting bias whereby men report less fear than women in order to acquiesce to gender role norms or expectations (e.g., to avoid looking “weak” or “scared”; Pierce & Kirkpatrick, 1992; Unruh, 1996; Holtzman et al., 1997). Gender differences in communication styles also may be at play (Street, 2002). Still, reporting and communication differences/biases do not completely account for the gender difference (Fredrikson et al., 1996; Abrahamsen, Berggren, & Carlsson, 2002; Craske, 2003). Whether these robust self-report differences are evident in overt behavior and psychophysiological response is an area deserving of greater attention.

Changes in dental fear/anxiety across the life span are not well understood, although both longitudinal (Thomson et al., 2009) and cross-sectional (Oosterink et al., 2009b) data suggest it is stable in most people, across decades, perhaps with some variation. Like other fears/anxieties, there are developmental changes across childhood and adolescence (e.g., Oliveria & Colares, 2009). There are suggestions that dental fear/anxiety levels are higher until the early 20s (Oosterink et al., 2009b) and then increase again in mid-life (Oosterink et al., 2009b) with decreases in later life (Locker & Liddell, 1991; Armfield et al., 2006).

Differences across socioeconomic status also are not well studied. Nevertheless, most evidence supports the idea that segments of the population who are of lower socioeconomic status have greater levels of dental anxiety/fear (Armfield et al., 2006). Lower income level is associated with greater dental anxiety/fear (Doerr et al., 1998); the relation with educational level is more uncertain (Stouthard & Hoogstraten, 1990).

The prevalence of dental care-related anxiety and fear is alarming and is a global public health issue, given the impact of the phenomenon on dental treatment-seeking and, ultimately oral, physical, and psychological health. Individuals who receive fewer than one dental checkup per year are more likely to be highly anxious than individuals who receive more frequent checkups (Doerr et al., 1998), and, controlling for sociodemographic variables, fear of dental pain and fear of dental treatment is correlated with avoiding scheduling dental appointments and utilizing dental treatment (Meng et al., 2007). Generally speaking, dental care-related fear and anxiety are associated with avoidance of dental visits (Armfield et al., 2007). This avoidance of treatment is related to greater incidence of decayed and missing teeth and a lower incidence of filled and functional teeth (Schuller, Willumsen, & Holst, 2003). Poorer oral health resulting from the avoidance of treatment and untreated oral disease may worsen cardiovascular disease and diabetes, among other systemic health concerns (Williams et al., 2008), and can even negatively affect the health of an unborn fetus (Offenbacher et al., 1996; Gaffield et al., 2001). Additionally, dental care-related fear and anxiety and associated oral health complications may result in dissatisfaction with one's dentition and lower perceived quality of life, self-esteem, and morale (Doerr et al., 1998; Locker, 2003; Crofts-Barnes et al., 2010). Clearly, dental care-related fear and anxiety should be considered and addressed by the dental professional as they are psychosocial barriers to dental treatment that can greatly impact the physical and psychological well-being of patients.

Assessment of Dental Care-Related Fear and Anxiety

Evaluation in this area is a key process in that it allows for an overarching understanding of the constructs of dental fear, anxiety, and phobia and any developmental or other change over

time; the careful evaluation and monitoring of the individual patient; and the testing of pharmacologic, behavioral, and integrated methods for treatment of clinically significant levels of these anxieties and fears. Since dental care-related fears and anxieties present themselves uniquely across patients, comprehensive assessment is essential in understanding the phenomena across populations and cultures globally, and to garner an idiographic understanding of each patient so that the individual may be afforded a more tailored and comfortable treatment experience. Assessment of *degree* or *level* of anxiety and/or fear is necessary, as patients may fall anywhere on a dental care-related fear or anxiety continua (i.e., not just in a fearful vs. nonfearful category). Cutoff scores for dental fear and anxiety questionnaires are commonplace, yet are problematic, both in the clinic and for research purposes, in that they promote a categorical, rather than a dimensional view of anxiety and fear. Moreover, use of cutoff values, instead of continuous scores, allows for misclassification bias, in that individuals who are just below or just above the cutoff differ very little (Thomson et al., 2009), and can limit statistical analyses, from a research viewpoint.

Both scientifically and clinically, dental care-related anxiety and fear, like other types of anxiety and fear, are manifested in three systems of expression: verbal report, overt behavior, and psychophysiological response (Lang, 1968). For research purposes, the most thorough-going assessments involve more than one of these modalities, and include more than one method of assessment of each (i.e., multimodal and multimethod). In clinical practice, however, including even a single dental fear/anxiety item in a health history may be the most realistic possibility. Across these modalities, individuals can manifest fear intensely in one area, and little or not at all in another. Nevertheless, the individual still is fearful or anxious, even if he is not a physiological responder, or manifests fear primarily in overt behavior (e.g., avoidance, rudeness to the dental staff; “white knuckle” grasping of the arm of the dental chair) while

protesting that he is “not afraid.” At present, verbal reports, specifically self-administered Likert-type paper/pen-and-pencil questionnaires, are the overwhelmingly prevalent means of assessment of dental care-related anxiety and fear. Nevertheless, the field seems to be frozen in time in terms of a seemingly blind allegiance to verbal report assessment.

Verbal Report Assessment of Dental Care-Related Fear and Anxiety

There have been a number of self-report instruments of varying lengths developed for the assessment of dental care-related fear and anxiety. Only some the major instruments can be described here, but comprehensive reviews are available from Schuurs and Hoogstraten (1993), Aartman et al. (1998), Newton and Buck (2000), and Armfield (2011). An early questionnaire created and validated for the purposes of measuring degree of dental care-related anxiety was Corah’s Dental Anxiety Scale (DAS; Corah, 1968), one of the most commonly used measures for assessing dental care-related fear and anxiety, primarily because of its short length. The DAS is a 4-item measure on which patients indicate the severity of their likely responses to dentally related situations. The scale is very widely used; internal consistency and test-retest reliability are high (Corah, Gale, & Illig, 1978; Newton & Buck, 2000). A modified version of the DAS (Modified Dental Anxiety Scale [MDAS]; Humphris, Morrisson, & Lindsay, 1995), which instead contains five items, including one about a dental injection, also has a high degree of demonstrated reliability and validity (Newton & Buck, 2000). Both instruments have been criticized, however, for inadequate assessment, related to content and construct validity, incompletely measuring the domain of dental care-related anxiety and fear (e.g., Schuurs & Hoogstraten, 1993; Armfield, 2010b). One of the issues for the field is that the DAS and MDAS have been so widely used that they seemingly have come to define what dental anxiety and fear constitute; these constructs, however, are

much broader than can be comprehensively measured by a 4- or 5-item questionnaire.

The Dental Fear Survey (DFS; Kleinknecht, Klepac, & Alexander, 1973) is a 20-item self-report measure of fearful and anxious reactions to dental situations. The instrument contains three subscales (behavioral avoidance, physiological responses, and fear of specific stimuli), is widely used in behavioral dentistry research, and has well-evidenced reliability and validity (McGlynn et al., 1987; Smith & Moore, 1995; Heaton et al., 2007). It has been translated into many languages other than English, making it more widely available to researchers and clinicians alike. The DFS has considerable utility in its clear assessment of dental care-related fear and anxiety in multiple domains and provides information that allows the dental professional to tailor management strategies to individual patients.

In response to theoretical and practical limitations of existing dental care-related fear and anxiety assessment instruments, Armfield (2010a) developed the Index of Dental Anxiety and Fear (IDAF-4C⁺). This 23-item instrument contains three modules: one that measures dental anxiety and fear, another which measures dental phobia, and a third that measures feared dental stimuli. Internal consistency, test-retest reliability, and validity were demonstrated to be good in instrument development studies. Though the measure is very new, it is a promising new development in verbal report dental care-related fear and anxiety assessment. The scale has strong theoretical underpinnings, is relatively short while maintaining good psychometric properties, and can provide specific information about the anxiety- and fear-evoking dental treatment-related stimuli and experiences.

Given the ever-growing time demands in health care, it may be the case that a lengthy self-report assessment of dental care-related fear and/or anxiety simply is not possible. Providers who do not want to abandon standardized dental care-related fear/anxiety assessment altogether may find utility in single-item self-

report assessment tools in order to gain some knowledge of patients' level of dental care-related fear or anxiety. The final, omnibus item (Question 20) of the DFS is one such item; it correlates quite highly with the full-scale score of the DFS (Kleinknecht & Bernstein, 1978). The IDAF-4C⁺ also has a single item for assessing dental care-related fear and anxiety. The Dental Anxiety Question (DAQ; Neverlien & Backer Johnsen, 1991) is another one-question measure that seems to correlate well with other self-report measures of dental care-related fear. While other single items have been proposed, these three single-item measures have the strongest psychometric basis.

It is important to note that even though single-item self-report assessment instruments may be appealing because of their efficiency and minimal burden on the patient, they offer relatively sparse information about a patient's dental care-related fear or anxiety. Ideally, dental professionals would use single-item measures to screen for patients who may have elevated levels of dental care-related fear and/or anxiety and would follow up with longer, more comprehensive self-report assessment instruments, as well as other assessment strategies, in order to gain a complete understanding of the patient's fears and/or anxieties. It is strongly recommended that such measures be included as part of standard health histories; it is important to note that the wording and response options for the items should not be changed. Being careful to utilize the exact wording of these assessment tools maintains their psychometric properties, ensuring their utility, reliability, and validity.

Other related constructs also frequently are measured via verbal report and are important to the understanding of dental care-related anxiety and fear. The Revised Dental Beliefs Survey (DBS; Smith et al., 1984; Coolidge et al., 2005) is a 28-item self-report measure of feelings about and reactions to dental work, dentistry, and dental professionals. It assesses cognitions about the dental situation in three domains: professionalism, communication, and lack of

control. The instrument has demonstrated reliability and validity (e.g., Kvale et al., 2004a; Coolidge et al., 2005; Abrahamsson et al., 2009) and is useful in evaluating the patient's potential mistrust of the provider or discomfort with feeling out-of-control. Relatedly, the Dental Cognitions Questionnaire (DCQ; de Jongh et al., 1995) assesses the nature of negative thoughts related to dental treatment. Frequency and believability of such cognitions are measured using this 38-item self-report instrument; a total cognitions frequency score and believability score both can be calculated. The Fear of Pain Questionnaire-III (FPQ-III; McNeil & Rainwater, 1998) is a 30-item self-report measure of pain-related fear. The instrument consists of three subscales: severe pain, minor pain, and medical pain, with some items that specifically address dental pain. Patients indicate how fearful they are of experiencing the pain associated with each of a number of painful experiences (dental and nondental). There is good support for the three-factor solution of the FPQ-III and good evidence for reliability and validity (Osman et al., 2001; Roelofs et al., 2005). A shorter, 9-item version of the FPQ-III exists, the Short Form of the Fear of Pain Questionnaire (SF-FPQ) and may be of more utility in general screening. Developed as the "dental version" of the FPQ-III, the Fear of Dental Pain Questionnaire (van Wijk & Hoogstraten, 2003) is a 21-item self-report instrument that specifically assesses fear of dental pain. Psychometric work suggests that the measure taps fear of dental pain as a single dimension; originally created in Dutch, there is a short, 5-item version in English (van Wijk et al., 2006).

Behavioral Assessment of Dental Care-Related Fear and Anxiety

The assessment of overt behavior among adult patients in the waiting room and dental operatory truly is in its infancy. Some research has been devoted to dentists' evaluation of highly anxious/fearful patients, but primarily with children (e.g., ten Berge et al., 2002). There has

been limited work to assess patients' overt behaviors, with some findings to suggest certain "nervous" behaviors, such as leg-swinging by highly anxious/fearful patients awaiting dental treatment, while in the waiting room (Kleinknecht & Bernstein, 1978).

The dental situation necessarily restricts the range of possible overt behaviors that might be assessed. Facial expressions offer a rich source of emotional and pain-related information which would be accessible during much, but not all, of dental treatment. Amount and content of spontaneous speech (e.g., humor, question-asking), eye closures, use of the hands, speed at which a patient sits in the dental chair, asking for breaks during procedures, and many other behaviors may provide a bounty of data about dental care-related fear and anxiety. Nevertheless, the most important overt behaviors on which to focus are the ones that lead to an empty dental chair—avoidance, delaying appointments, or "escaping" from appointments by late cancellations or rescheduling.

Physiological Assessment of Dental Care-Related Fear and Anxiety

Psychophysiological responses frequently are manifested in the context of dental care, although there are significant individual differences in degree of autonomic reactivity (Brand, 1999). In working with patients, dental professionals may observe perspiration on the palms, forehead, or upper lip, and may note increased respiration rate, and may detect high heart rate or blood pressure (Milgrom et al., 2009). The inclusion of psychophysiological measures in investigations of dental fear/anxiety, however, is infrequent, likely due in part to the relative complexity of recording and analyzing such data, and integrating them with other measures (i.e., self-report and behavior). Nevertheless, such information is a valuable source for a comprehensive, multimodal understanding of dental anxiety, fear, and phobia. Cardiovascular responses in association with dental care have been extensively studied (Brand &

Abraham-Inpijn, 1996). Specificity of responses among high dental anxiety/fear participants has been demonstrated with skin conductance (Lueken et al., 2011); forehead muscle tension and heart rate also have been found to vary with the severity of dental fear/anxiety (Lundgren, Berggren, & Carlsson, 2001). There also has been some focus on the intensity, organization, and pattern of psychophysiological response among individuals with high dental anxiety/fear and/or dental phobia, relative to other types of phobia (e.g., McNeil et al., 1993; Leutgeb et al., 2011; Lueken et al., 2011). These data are consistent with the idea that, across the population of individuals with dental phobia, the disorder is most typically a situational type, although as already noted, DSM-5 (APA, 2013) appears to compel its diagnosis with a blood-injection-injury code. A minority of individuals with dental phobia, of course, may be better classified as the BII type, with the vasovagal syncope response.

Other Approaches to the Assessment of Dental Care-Related Fear and Anxiety

Brief and efficient methods other than self-report are needed to broaden the scope of assessment for dental care-related anxiety and fear. The Dental Fear Interview (Vrana, McNeil, & McGlynn, 1986) is a semistructured interview designed to assess dental care-related fear. Targets of the interview include the scope, etiology, and the specific or generalized nature of dental fear/phobia, along with related avoidance behavior. Advantages include the opportunity to establish rapport during the interview, to ask individualized follow-up questions in areas of particular concern, and to observe non-verbal behavior during answering by the patient or participant.

To truly advance the field, new, even novel, approaches, beyond self-report must be developed. The field of cognitive psychology and neuroscience offer various methods that do not rely on conscious self-evaluation, but rather

depend on natural science variables (e.g., reaction time) that reflect cognitive biases and other processes. As one example, Stroop color-naming tests have been developed, using dental words as emotionally evocative stimuli (Muris, Merckelbach, & de Jongh, 1995; Johnsen et al., 2003; McNeil et al., 2013b). In such applications, response time has been measured across dental phobic patients versus healthy controls, contrasting dental and neutral words.

Interventions for Dental Care-Related Anxiety, Fear, and Phobia

The uniqueness of the dental situation requires specialized, expert interpersonal, communication, and “chairside” skills on the part of dental professionals, and all staff working with dental patients. Like pain or potential pain in the dental operatory, it also is critical to prevent or manage fear and anxiety. Appropriate management of the dental care-related fear or anxiety will increase the likelihood that the more highly fearful or anxious patient will have a comfortable experience, thus providing learning opportunity that dental treatment is not necessarily threatening, uncomfortable, painful, or distressing. Over time, such opportunities may help to quell fear or anxiety responses, ultimately improving treatment-seeking patterns and treatment adherence, with positive implications for oral, systemic, and psychological health.

For a majority of dental patients, the level of discomfort falls within a range on the anxiety/fear continua that can be adequately managed by a competent oral health provider. Strategies for managing such levels of fear or anxiety are based on basic psychological principles such as clear and sensitive communication, psychoeducational approaches, relaxation, distraction, accurate appraisal of threat or danger, and other coping skills. Another chapter of this book is dedicated to the “chairside” strategies for reducing dental care-related fear and/or anxiety,

techniques which may be used by the oral healthcare provider during treatment. Described here are approaches and interventions that may be particularly appropriate for especially fearful or anxious (or even phobic) dental patients, though they certainly have relevance and applicability to patients who have any degree of fear and/or anxiety. Asking about dental anxiety and fear on intake forms (perhaps through the use of a psychometrically supported single-item anxiety/fear screening question) and in health histories can demonstrate concern about the patient's comfort. A key ingredient of each of these fear- or anxiety-reducing strategies is high-quality rapport. Using clear, sensitive but direct, and honest communication strategies with patients is one important component of rapport-building, along with numerous others, such as facing the patient and making eye contact, rather than focusing on a paper chart or computer screen and keyboard. Experts have suggested that the content of initial rapport-building not be "small talk," but rather focus on the patient's concerns, expectations, and treatment-related interests (Milgrom et al., 2009). Demonstrating that the patient is heard and understood will convey empathy and compassion that can facilitate rapport-building, reduce acute dental care-related fear and/or anxiety, and prepare the patient for other interventions to prevent or manage dental care-related fear and anxiety.

In addition to chapters elsewhere in this volume, there are a number of other resources that are useful for more comprehensive reviews of strategies for working with highly fearful, anxious, and/or phobic patients: (a) *Oral Psychophysiology: Stress, Pain, and Behavior in Dental Care* (Eli, 1992); (b) *The Psychology of Dental Care* (Kent & Blinkhorn, 1991); (c) *Treating Fearful Dental Patients: A Patient Management Handbook* (Milgrom et al., 2009); (d) "Dental Fears in General Practice: New Guidelines for Assessment and Treatment" (Milgrom & Weinstein, 1993); and (e) *The Fearful Dental Patient: A Guide to Understanding and Managing* (Weiner, 2011).

Behavioral, Cognitive-Behavioral, and Educational Interventions

There is a host of interventions, such as psychoeducation, stimulus control, social praise, modeling, behavioral control, exposure therapy, relaxation, paced breathing, systematic desensitization, stress inoculation training, hypnosis, and biofeedback, which can be used to prevent or reduce dental care-related fear and anxiety. A meta-analysis of behavioral interventions (Kvale, Berggren, & Milgrom, 2004) indicated that such approaches yield reductions in self-reported dental care-related anxiety/fear with medium to large effect sizes, and that reductions are maintained over the long term, at least four years. In that review, interventions were categorized as behavioral, cognitive, or educational in nature. About half of the 38 reviewed studies used some combination of these approaches. This same system is used here to categorize various psychosocial principles and approaches.

Behavioral Interventions

As a part of good practice, dental professionals typically keep needles and syringes out of sight before, during, and after treatment and take special care in bringing a syringe toward the face and mouth such that the patient is not able to easily see them. Based on the principle of "stimulus control," this masking or hiding of fear cues can prevent the eliciting of a fear response and can offer a more comfortable treatment experience.

Social praise is another part of good practice, in which the practitioner acknowledges appropriate behaviors, or coping behaviors, particularly after a patient undergoes uncomfortable aspects of treatment. Utilizing a *labeled praise* is the most effective of social praise, as it communicates clearly what the patient did that elicited the practitioner's response. It also serves to elicit positive feelings, and thus enhances the relationship between patient and provider. For example, a dentist may say to her patient,

following an injection: "You were able to stay so still during the injection; that's wonderful!" This praise serves as a reinforcer, making positive, appropriate responses to fear-provoking stimuli more likely in the future, essentially training the patient to behave in a desirable manner during once-feared situations and ultimately making his or her experience less distressing.

Modeling is based on the understanding that many behaviors are learned via observation and perpetuated through subsequent reinforcement. A dentist or dental hygienist might model appropriate behavior, including positive coping statements (e.g., While keeping my mouth open, I tell myself: *I can do it*) during a potentially uncomfortable or fear-provoking dental experience. For example, as part of a tell-show-do chain, the dental hygienist could demonstrate how an instrument will be used to scale teeth, making certain to portray calm, collected reactions and suggesting positive thoughts throughout the demonstration. Alternatively, a dental professional could show a fearful dental patient a video recording of a model patient who copes well while undergoing a fear-inducing procedure. According to Weiner (2011), using modeling in the dental clinic provides a vicarious experience in which the patient learns that reinforcement will follow appropriate behavior, and offers information to familiarize the patient with the upcoming treatment.

Behavioral control involves giving the patient opportunities to make decisions before and during treatment, to stop for a break when needed, or to guide certain aspects (e.g., the pace) of treatment. As lack of control (as well as lack of predictability) is a key determinant of anxiety and fear, as well as pain, allowing patients a role in decision making can help to ameliorate anxiety and fear. (See Chapter 7 on dental pain in this volume for a more complete discussion of behavioral control, and as noted later, on informational control issues.)

Based on the conceptualization that irrational fears are, at least in large part, learned and can therefore be "unlearned," various

approaches have been utilized to help patients learn to approach rather than avoid dental care, and to cope effectively while in the operatory. Most of the existing literature has focused on systematic desensitization (Kavle et al., 2004a), a process in which a patient first learns a relaxation strategy, and then is gradually "exposed" to fear-evoking stimuli (e.g., the dental chair, sound of the drill), typically in a stepwise fashion. Prompting new conditioning to take place helps patients to learn that stimuli that once evoked fear are not so threatening, and to develop coping abilities that allow them to successfully participate in dental treatment. These strategies may need to be tailored, depending on the cultural background of the patient and/or the culture in which dental treatment is being performed (Milgrom & Heaton, 2013).

Various relaxation strategies, even pharmacologic ones, can be employed with systematic desensitization. (See Chapter 10 on chairside methods for working with highly fearful/anxious patients in this volume for a discussion of relaxation methods.) Relaxation training and practice can be used alone, or as a part of systematic desensitization, to help highly fearful/anxious dental patients. One method in particular deserves mention, given its suitability for the dental situation. Paced breathing (Fried, 1993) can be used chairside to induce relaxation, with minimum time needed for instructing the patient. Briefly, the patient can be instructed while supine in the dental chair, even in the middle of a procedure. Slow, diaphragmatic breathing is taught, often with the dental professional demonstrating (i.e., using participant modeling) while instructing the patient. Counting up and/or down and using relaxing words (e.g., *calm*) as cues, the patient can be advised to continue use of paced breathing throughout procedures, or to induce relaxation during systematic desensitization.

The *sine qua non* of systematic desensitization and other psychosocial approaches to fear and anxiety reduction, however, are exposure therapy. Necessary, and sometimes sufficient, exposure has an enormous body of literature

demonstrating its efficacy and effectiveness (Foa & Kozak, 1985; Ost, 1996; McNeil, Kyle, & Nurius, 2012a). One of the primary purposes of relaxation in systematic desensitization may be to make exposure more palatable for patients (McNeil et al., 2012a). Exposure therapy is particularly relevant to the oral healthcare professional and often is used as a “common sense” approach, one that is sensible to both the patient and provider, in that the patient can gradually become accustomed to receiving necessary care. Often, an exposure-based treatment approach to reducing or eliminating a crippling fear or phobia of the dental situation involves creating a “fear hierarchy,” a list of each of those feared stimuli and experiences that are associated with dental treatment, arranged in order from least distressing to most distressing. Taking an imaginal (i.e., the patient imagines the experiencing the situation or stimulus), *in vitro* (i.e., the patient experiences aspects of the situation or stimulus in a neutral environment such as a workroom or therapist’s office), or *in vivo* (i.e., the patient physically experiences the situation or stimulus) approach, the clinician guides the patient through the hierarchy, supporting the patient as he or she is made to encounter each of the feared stimuli until habituation occurs and the patient no longer experiences fear or anxiety in his or her presence. In one possible approach, the patient is exposed to each stimulus in the hierarchy one at a time, only after preceding stimuli are conquered. This “face your fears” approach is similar to systematic desensitization, but does not require the learning and use of a relaxation technique. The patient learns that once-feared stimuli are not as threatening as once thought and, therefore, do not need to be avoided in the future.

Utilizing exposure therapy for dental care-related fear or dental phobia sometimes may require that the patient has multiple visits to the clinic before actual treatment may begin. For example, a highly fearful patient may report to the clinic and simply wait in the reception area, then, on a second visit, may report to the clinic just to conquer the fear of sitting in the dental

chair, and then, on a third visit, may sit in the dental chair and allow the dentist to bring a mouth mirror up to the mouth before returning for a fourth visit to finally receive the necessary dental treatment. Some of these individual exposure sessions may provide opportunities for rehearsal, a learning experience when the dental professional and patient can “practice” a procedure without actually completing it, giving the patient insight into what he or she can expect, allowing a sense of self-efficacy that will lead to successful treatment later.

Theoretically, exposure need not be gradual, although it likely is more acceptable to both patients and providers when conducted in that way. One-session exposure treatments have been tested for phobic disorders other than that related to dental care (Öst, 1989), but dental patient and provider acceptance of such approaches are uncertain and may accentuate concerns about patient refusal and dropout.

Biofeedback is another approach that can be helpful for certain highly fearful or anxious dental patients. Using apparatus of varying degrees of complexity, biofeedback provides information, typically in real time, to patients who are learning to monitor and control physiological reactivity. Biofeedback procedures involve measuring physiological arousal—for example heart rate, sweat gland activity, or muscle tension—through the use of electronic monitoring and recording machines. Patients who have learned to manage their physiological arousal can observe and alter their management strategies using the feedback provided by the technology. This approach can enhance the ability to engage in relaxation and other physiological management strategies, and also may offer distraction that can further aid in the reduction of dental care-related fear and anxiety symptoms. Biofeedback in the dental clinic and other medical settings has demonstrated efficacy and utility (e.g., Hirschman, 1980; Oliver & Hirschman, 1982; Milgrom et al., 2009).

A method with a long history of use in dentistry is hypnosis (Gow, 2011). Requiring specialized training for professionals utilizing this

technique, hypnosis is a viable option for some patients who are open to this approach to coping with fears and anxieties about dental treatment. Briefly, hypnosis involves utilizing suggestions and imaginative experiences, communicated by the dental professional to the patient, in order to alter perceived aspects of the experience, including emotions, cognitions, and behavior (Gow, 2011). Training in self-hypnosis can be helpful for patients to learn durable coping strategies. Interested readers can consult Chapter 6 on hypnosis in this volume, and work by Kroger and Yapko (2007), Brown (2009), or Gow (2011) for more information about the use of hypnosis in dental practice.

Cognitive Interventions

Targeting misappraisals of the dental situation (e.g., catastrophizing) or distrust may be particularly warranted for some patients. Many patients who are especially fearful of or anxious about dental work have irrational, overly negative, or catastrophic ideas about procedures that are to be performed. Sometimes these misappraisals are the result of misinformation (e.g., hearing others talk about the pain associated with root canal therapy) and at other times are perpetuated, as suggested by the Cognitive Vulnerability Model (Armfield et al., 2008) and other cognitive models of fear and anxiety, by a tendency to overthink and to catastrophize.

Helping patients to identify irrational thoughts and the emotions they produce is one step in cognitive restructuring. Perceived “dangerousness” and “disgustingness” of aspects of dental treatment (Armfield et al., 2008) could be a specific focus of these interventions. It may be particularly difficult for the patient to share negative, irrational thoughts with his provider, as it may be embarrassing, or potentially critical of the dentist or hygienist. The provider prompting and answering questions, and providing corrective information is another step along the way, along with helping the patient to rationally examine the evidence for irrational expectations. A practical example illustrates the use of such a technique: A patient who is fearful of

dental treatment because she believes that the drill is *very* likely to “hit a nerve” and cause shocking, highly intense pain, might first be asked to describe her fears in detail. She also could share whether this event has ever occurred to her. The dentist might then describe what is done to prevent such an occurrence, as well as educating the patient about local anesthesia, its benefits and limitations, including comments about the rarity of such an event. The dentist then could challenge the patient’s misperception by respectfully pointing out the likely reality, and then asking her to assess the likelihood of the drill “hitting a nerve” in her case. This type of cognitive restructuring can be used not only to change patient expectations about dangerousness, potential risks, and disgust, but also to help fearful patients view threatening stimuli, such as needles, sharp instruments, or sutures, in a more realistic and accurate fashion.

Psychoeducation

Providing patients with information is an essential component of ethical practice, in explaining recommended treatment plans, outlining risks and benefits, and obtaining informed consent. Working in the dental setting requires a high level of communication and other instructional skills, as trying to impart information in a way that it can be “heard” and comprehended (i.e., cognitively encoded, processed, analyzed, and decided or acted upon) by highly fearful and anxious patients certainly is a challenge. Securing a signature on a treatment plan or form alone truly is not proper or ethical practice, if the patient is so anxious or fearful that she does not understand what he or she is signing.

A variety of means to share information should be considered, based on the educational level and wishes of the patient, including film, written materials, and web-based approaches. Nevertheless, even with many advanced technological approaches available, the interaction between provider and patient still is of paramount importance, and often provides the best means to work effectively with patients to help

them become educated about dental procedures and other aspects of oral health care.

For those individuals whose fear or anxiety seems related to uncertainty, not knowing what might happen during dental procedures, it may be especially helpful to interact with them by providing informational control (Milgrom et al., 2009), that is, by sharing information in a psychologically sensitive fashion. This psychoeducational approach helps to increase predictability in the dental situation. It should be noted, however, that patients differ, according to their coping style, on how much information they want, and when. As already noted, see Chapter 7 on dental pain in this volume for a more complete discussion of predictability and control, including both informational and behavioral control issues.

One promising approach that is consistent with a psychoeducational approach and can “set the stage” for a highly fearful/anxious patient to receive needed dental care is motivational interviewing (MI; Miller & Rollnick, 2013). MI provides a framework for engaging and respectful interactions with patients, allowing oral healthcare providers (and others working in health care) to assist them in establishing goals and deciding upon health behavior changes and courses of action to deal with health problems (Ramseier & Suvan, 2010). Using an MI approach to interact with highly anxious/fearful dental patients to help prepare them for dental care is a promising area, one that is in need of empirical research.

Pharmacological and Integrative Interventions

There is a demonstrated need and demand for anxiety/fear control and sedation in highly fearful dental patients (Dionne et al., 1998; Chanpong, Haas, & Locker, 2005). Though behavior therapy for dental phobia typically is rated by patients as more acceptable than sedation (Newton, Naidu, & Sturmey, 2003; Forbes, Boyle, & Newton, 2012), many patients benefit from pharmacological fear- or anxiety-reducing

strategies. Evidence suggests, for example, that moderate (conscious) sedation produces the desired effects of less pain and anxiety, and memory of those emotions (Wilson et al., 2013). Of course, behavioral interventions may provide longer-lasting reductions in levels of dental care-related fear and anxiety, as pharmacological interventions do not necessarily offer opportunities to learn positive and effective self-coping strategies. It is recommended that the least invasive (i.e., behavioral or cognitive-behavioral) interventions be utilized initially with the understanding that nitrous oxide, anti-anxiety medications, sedation, or even general anesthesia may be necessary for the extremely fearful, anxious, or phobic patient. For example, deep sedation or general anesthesia (i.e., “sleep dentistry”) may be required in order to provide necessary, urgent care to the phobic patient who will avoid treatment unless he or she can be “put under.”

Recent research also indicates that pharmacological and behavioral approaches can be used in tandem in order to yield reduction in dental care-related fear. Use of an integrated approach involving a pretreatment behavioral exposure session, followed by sedative dental treatment, has been suggested by Milgrom and Heaton (2007). Such an approach allows patients to develop coping skills that can be used to manage their own anxiety/fear, improves the efficacy of the sedative medication, and ultimately reduces necessary dosages of the medication. Similarly, current work is identifying how medications such as D-cycloserine may be used to enhance the efficacy of behavioral interventions such as exposure therapy for dental care-related fear (see Heaton, McNeil, & Milgrom, 2010). Milgrom et al. (2009) suggest that four basic steps should be taken in order to decide whether to utilize pharmacological agents and what type to use: (1) Assess patients’ experiences with, and feelings about, medications; (2) Determine what the drug is being used for; (3) Identify what the patient will be doing/thinking during treatment and communicate the necessity for the patient to cope, even if

utilizing a pharmacological agent; and (4) Encourage patients, through real-time coaching, to use behavioral strategies and to take an active role in coping throughout treatment, while under the influence of the pharmacological agent. A number of pharmacological strategies, including nitrous oxide-oxygen analgesia, oral premedications, moderate (conscious) sedation, and deep sedation can be used in tandem with psychological approaches, and good chairside manner, for the management of dental care-related fear and anxiety.

Summary

Dental care-related fear and anxiety, and their extreme manifestations in dental phobia, are prevalent, severe, and long-lasting problems that negatively impact affected individuals, their families, workplaces, and communities, as well as oral care professionals and healthcare systems. The problems are so broad that they should be approached from a global public health perspective, in addition to the important work with individual patients who suffer tremendously from dental care-related anxiety and fear. There is a pressing need to develop more efficient and effective assessment and treatment strategies for these syndromes, some of which can be translated and integrated into traditional oral healthcare practice. Dental anxiety, fear, and phobia most often have been studied in industrialized, English-speaking nations, although some reports based on other peoples and lands now are appearing in the literature. There is a need to understand these phenomena and their treatment from a broader cultural lens.

Dental care-related fear and anxiety are separate, but related and often intertwined, states that exist on continua. They can be of phobic proportions and even can lead to life-threatening avoidance of needed care. The experience of dental care-related fear and anxiety affects how patients understand their dental visits, perceive pain and other sensations related to dental

treatment, and, perhaps most importantly, utilize available professional oral health care.

Dental care-related fear and anxiety are individual experiences that may result from any of a number of mechanisms, each with greater or lesser influence, depending on a particular person's environment and previous experiences. Negative, even traumatic dental experiences can be part of the genesis of dental anxiety and fear, but a majority of patients are conditioned or otherwise learn to respond anxiously and fearfully to dental care in other ways. While there is a minority of individuals whose phobic concerns about dental care are best captured by a blood-injection-injury or blood-injury-illness type of Specific Phobia, or other psychopathological clinical syndromes, across the population, dental phobia would be best conceptualized as a Specific Phobia, Situational Type, contrary to DSM-5 (APA, 2013).

Critical for the effective treatment of dental care-related fear and/or anxiety is a conceptualization of the phenomenon as complex, multifaceted, culturally influenced, and highly individualized, utilizing an assessment of the nature of the fears/anxieties based on such a conceptualization. Oral health professionals can improve the quality of care and treatment utilization patterns by a comprehensive understanding of both the conceptual and clinical issues related to dental care-related fear and anxiety.

Patients with varying degrees of dental care-related fear and/or anxiety, and with diverse manifestations of such states, usually benefit from behavioral, cognitive, and educational interventions; exposure is the *sine qua non* of these approaches. Changes as a result of these psychosocial approaches typically are long-lasting, decrease avoidance behavior, and enhance regular attendance at oral healthcare appointments. Pharmacological approaches are essential in helping anxious, fearful, and/or phobic dental patients receive needed care, and can be used in an integrated fashion with psychoeducational, behavioral, and cognitive interventions.

Future research is needed to clarify the similarities and differences in dental care-related anxieties and fears. Assessment strategies that do not rely solely on verbal report also are needed, as is efficient screening (e.g., with psychometrically valid 1-item questions) in everyday practice. Needed are more effective and efficient psychosocial treatment strategies, specifically utilizing exposure, and particularly ones that can be employed by frontline oral healthcare professionals.

Prevalent and broad-ranging global public health problems, dental fear, anxiety, and phobia impair quality of life for many people across the world. Most needed are cultural shifts and societal-wide developments that change the portrayal of oral health care as essential, comfortable, and life-enhancing.

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Changing Behaviors



13

Behavior Management in Dentistry: Thumb Sucking

Raymond G. Miltenberger and John T. Rapp

Key points

- Thumb sucking, common in young children, often causes dental problems when it persists for years.
- Thumb sucking persists in most cases because it modulates arousal or provides sensory stimulation.
- Successful treatments must work in the absence of the parent as thumb sucking often occurs when the child is alone.
- Successful treatments involve response prevention, management of covarying behaviors, consequence procedures, and combination procedures.

Thumb and finger sucking (hereafter called thumb sucking) is common in early childhood. Studies of the prevalence of thumb sucking show that one quarter to one half of children aged 3–6 years suck their thumbs (e.g., Troster, 1994; Widmalm, Christiansen, & Gunn, 1995; Gutermuth-Foster, 1998). Interestingly, studies conducted in other countries have shown

that the prevalence of thumb sucking is substantially lower (e.g., Vignarajah & Williams, 1992; Kharbanda et al., 2003), suggesting that thumb sucking may be influenced by cultural practices.

Although there is very little empirical support for the notion that thumb sucking is symptomatic of psychological disturbance or

psychopathology in children (e.g., Tryon, 1968; Friman, Larzelere, & Finney, 1994), a number of physical problems are correlated with thumb sucking if it persists beyond the age of 4 or 5 years. Thumb sucking may contribute to malocclusion (e.g., Reid & Price, 1984; Afzelius-Alm et al., 2004), digital deformities (e.g., Reid & Price, 1984; Rankin et al., 1988; Malek, Oger, & Rivet-Forsans, 1994), temporomandibular disorders (e.g., Widmalm et al., 1995; Sari & Sonmez, 2002), altered facial-muscle activity (Ahlgren, 1995), and increased susceptibility to toxins (e.g., Cowie, Black, & Fraser, 1997). In addition to physical problems, Friman et al. (1993) found that first graders who engaged in thumb sucking received lower ratings of social acceptance from their non-thumb-sucking peers. Thus, children who continue to suck their thumb beyond the age of 4 years may require behavioral intervention. This chapter discusses behavioral assessment and intervention for thumb sucking.

Assessment of Thumb Sucking

Behavioral assessment of thumb sucking is necessary to document the severity of the problem and to evaluate the effects of treatment. Behavioral assessment will involve direct observation and recording of the behavior as it occurs in the child's natural environment. To make assessment most valid, observations should be conducted at the time and in the location the child is most likely to engage in thumb sucking.

Because the length of time the thumb is in the child's mouth is the most important aspect of the behavior, a duration measure often is chosen for recording thumb sucking. Duration events typically are measured in one of two ways. An observer can record the total number of seconds during an observation period for which a child engages in thumb sucking. This approach is often referred to as continuous duration recording (CDR; Rapp et al., 2007). When using CDR, an observer records the length of time thumb sucking is observed throughout the designated observation period and then reports the per-

centage of time for which the behavior occurred (duration of thumb sucking divided by the duration of the observation period; Long, Miltnerberger, & Rapp, 1999b; Rapp et al., 1999). Alternatively, when CDR is viewed as too effortful or time-consuming, an observer can utilize discontinuous recording methods such as momentary time sampling (MTS). Although discontinuous methods are less sensitive for detecting changes in thumb sucking produced by intervention, a number of studies have shown that MTS with interval sizes up to 30 seconds can detect a high proportion of meaningful changes in duration events (Meany-Daboul et al., 2007; Rapp et al., 2007, 2008; Devine et al., 2011). When using MTS with 30-second intervals, the observer divides the observation period into consecutive 30-second bins and designates 1 second in each bin (typically the first or last second; the rest of the interval is ignored) that will be scored for the presence or absence of thumb sucking. As noted earlier, using 30-second intervals with MTS will typically permit the observer to detect real changes in thumb sucking during 10-minute to 60-minute observation sessions (Rapp et al., 2008; Devine et al., 2011). Upon completion of each observation session, the observer should calculate the percentage of scored intervals by dividing the number of scored intervals by the total number of intervals in the observation session. In order to evaluate the effects of an intervention on thumb or finger sucking, the results for each observation session should be represented in a linear graph. Figure 13.1 shows hypothetical data collected with 30-second MTS across five observation periods wherein no intervention is implemented for thumb sucking.

Because thumb sucking often occurs only when the child is alone, it may be necessary to observe the behavior surreptitiously while the child is alone (e.g., via video, through an observation window, or during unannounced checks; Friman, Barone, & Christophersen, 1986; Long et al., 1999b; Rapp et al., 1999). For example, Rapp et al. (1999) placed a video camera in the family room of the child's home to record thumb

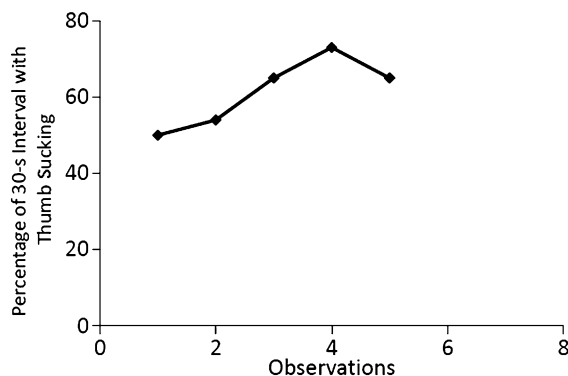


Fig. 13.1. Example of hypothetical data collected with 30-second MTS across five observation periods and plotted in a line graph.

sucking because the parents reported that the child typically sucked his thumb while watching television there. Videotaped observations can be scored using either CDR or MTS methods, although CDR is preferred as the more rigorous method.

Functional Assessment of Thumb Sucking

Various forms of social reinforcement from the parent often are found to maintain child problem behaviors (e.g., positive reinforcement involving attention from parents, negative reinforcement involving escape from aversive tasks) and thus, treatment involves modifying parental responses to the behavior. However, thumb sucking is a behavior that typically is not maintained by social consequences but through some reinforcing outcome produced by the behavior itself. The reinforcing outcome of thumb sucking is thought to consist of arousal reduction or modulation (automatic negative reinforcement; Friman, Boyd, & Oksol, 2001) or some form of sensory stimulation such as oral or digital stimulation (automatic positive reinforcement; Ellingson et al., 2000; Stricker et al., 2002). Thus, the reinforcer for thumb sucking typically is not under the parents' control.

Even though thumb sucking is likely to be automatically reinforced, it is nonetheless important to conduct a functional assessment to identify or rule out any possible social reinforcement for the behavior. A functional assessment, typically conducted through interview or direct observation, identifies the antecedents and consequences associated with the behavior (Lennox & Miltenberger, 1989; O'Neill et al., 1997).

In a functional assessment interview, the therapist asks the parents to identify all of the situations in which thumb sucking occurs (antecedents) and asks the parents how they or other caregivers typically respond to the behavior (consequences). If thumb sucking is automatically reinforced, it occurs most often when the child is alone, or occurs across situations, with no consistent reaction from the parent. In many cases, thumb sucking occurs mainly when the child is alone due to a history of punishment for the behavior (e.g., scolding) when it has occurred in the parents' presence (Rapp et al., 1999). If thumb sucking is socially reinforced, it will be more likely to occur in the presence of the parents or other persons who provide reinforcing consequences. Possible reinforcing consequences for thumb sucking include attention (e.g., expressions of concern, reprimands, or emotional responses contingent on thumb sucking), the provision of other reinforcers (e.g., receipt of a pacifier, candy, or another item to suck on contingent on thumb sucking), or escape from aversive activities or situations (e.g., being removed from an activity or event contingent on thumb sucking). Although it is possible that thumb sucking can be reinforced by such events, results from most studies suggest that thumb sucking is maintained by nonsocial events (e.g., sensory stimulation).

In addition to conducting a functional assessment through an interview and direct observation of the behavior, in some cases, a functional analysis is conducted to identify the reinforcer maintaining thumb sucking (Rapp et al., 1999; Ellingson et al., 2000; Stricker et al., 2002). In a functional analysis, possible reinforcing

consequences are manipulated to demonstrate their influence on the target behavior. For example, Rapp et al. (1999) conducted three experimental conditions to determine whether thumb sucking was maintained by social or automatic reinforcement for two 5-year-old boys. In one condition, the parents provided attention contingent on thumb sucking (to assess positive reinforcement). In another condition, the parent made requests and allowed the child to escape the requests contingent on thumb sucking (to assess negative reinforcement). Finally, thumb sucking was recorded when the child was alone to determine whether the behavior persisted in the absence of social reinforcement (to assess automatic reinforcement). Rapp et al. found that thumb sucking occurred almost exclusively in the alone condition. Other researchers have found similar results in their functional analyses of thumb sucking (Ellingson et al., 2000; Stricker et al., 2002).

Iwata and Dozier (2008) provided guidelines for conducting multiple forms of brief functional analysis. Given that thumb sucking often is assumed to be automatically reinforced, it can be measured during three to six 10-minute sessions wherein no social interaction is provided to the child. If the behavior occurs at high, stable levels across sessions, the function of the behavior is confirmed and an intervention can be initiated. Figure 13.2 depicts hypothetical data collected with 30-second MTS wherein thumb sucking decreased without social consequences (upper panel) and persisted without social consequences (lower panel). As noted earlier, most studies show that thumb sucking is an automatically reinforced behavior. Nevertheless, if the behavior decreases across the no-interaction sessions, it suggests that thumb sucking is maintained by social consequences, and additional test conditions are needed (Iwata & Dozier, 2008). In a functional analysis test condition, the potential reinforcing consequence is delivered for each instance of the behavior (e.g., attention, escape from a task), and in a control condition, that reinforcer is given freely with no consequence delivered for the behavior. In the event

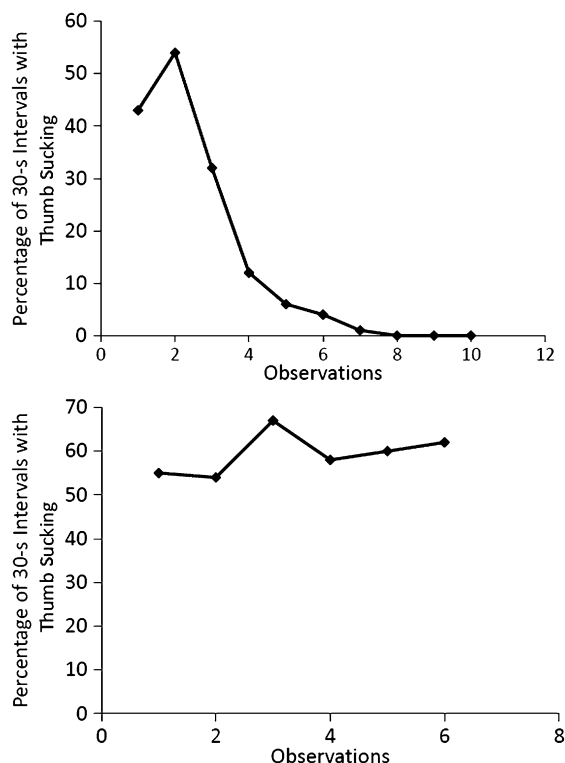


Fig. 13.2. Hypothetical data sets showing thumb sucking extinguishing without social consequence (upper panel) and persisting without social consequences (lower panel).

that it is necessary to compare levels of thumb sucking in a test and control condition, practitioners should conduct at least three sessions with each condition to avoid false positives (Kahng & Iwata, 1999; Hanley, Iwata, & McCord, 2003; Bartlett, Rapp, & Henrickson, 2011). Figure 13.3 provides an example of a test versus control functional analysis of thumb sucking. The identified function of thumb sucking then dictates the chosen intervention.

Treatment for Thumb Sucking

If the results of a functional assessment or functional analysis identify social reinforcement for thumb sucking, intervention will involve

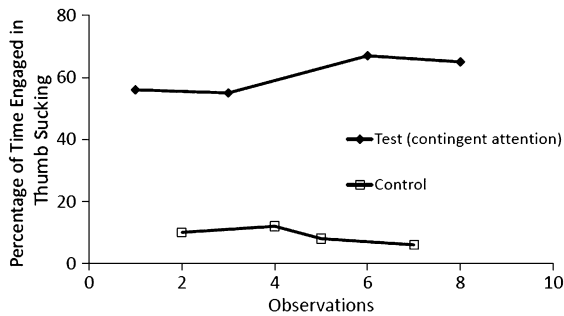


Fig. 13.3. Example of hypothetical results from a brief functional analysis with a test condition (contingent attention) versus a control condition.

(a) extinction—withholding the reinforcer for thumb sucking, (b) differential reinforcement—providing that reinforcer for the absence of the behavior or for alternative behaviors to replace thumb sucking, and (c) antecedent procedures—providing that reinforcer noncontingently to decrease the motivation for thumb sucking (e.g., Miltenberger, 2012). However, because thumb sucking typically persists in the absence of social reinforcement and often occurs when the child is alone, interventions that alter the antecedents or consequences for the behavior in the absence of the parents or other adults usually are indicated; these procedures are described in the rest of this chapter.

Antecedent Intervention

Antecedent interventions exert their effect on a targeted behavior before that behavior is exhibited. Two types of antecedent interventions for thumb sucking have been evaluated; procedures that involved response prevention and procedures that influence thumb sucking by targeting covarying behaviors.

Response Prevention

A number of apparatuses, such as oral appliances, splints, gloves, and headgear have been used to physically prevent thumb sucking. Although a number of studies have described the use of oral appliances (e.g., Haskell & Mink,

1991; Viazis, 1991; Gawlik, Ott, & Mathieu, 1995; Greenleaf & Mink, 2003) and headgear (e.g., Taylor & Walker, 1997) as interventions for thumb sucking, few, if any, of these studies employed an experimental design to empirically evaluate treatment effects. In contrast, a number of behavioral studies have experimentally demonstrated that finger or thumb splints (e.g., Lassen & Fluent, 1978; Watson & Allen, 1993), gloves (Lewis, Shilton, & Fuqua, 1981; Ellingson et al., 2000), or taped cotton (Rolider & Van Houten, 1988) decreased or eliminated daytime and nocturnal thumb sucking.

In a representative study from this category, Ellingson et al. (2000) first conducted a functional analysis and determined that the finger sucking of two children, aged 7 and 10 years, occurred almost exclusively when each child was alone. In the second phase of the functional analysis, Ellingson et al. found that finger sucking was either greatly reduced or eliminated when adhesive bandages were worn on the fingers, which suggested that finger sucking produced automatic reinforcement in the form of oral or tactile stimulation. Treatment for both participants involved wearing a glove when each was alone (e.g., watching television, lying in bed). For the 10-year-old, the glove immediately eliminated finger sucking. In addition, fading of the glove was accomplished by systematically cutting off pieces over a 5-month period. In contrast, the 7-year-old continued to suck her finger even when she wore multiple gloves. Ultimately, her finger sucking was eliminated using an awareness enhancement device (AED; see later discussion). Although the glove was only effective for one child, parents of both participants rated the glove intervention as highly acceptable.

One limitation in the use of response prevention strategies should be noted. If the child is able to remove the apparatus (glove, splint, etc.) when the parent is not present, its effectiveness will be diminished. Therefore, the parents will need to monitor the child, perhaps surreptitiously, to insure that the apparatus is not removed.

Response Covariation

A number of studies have shown that thumb sucking is eliminated when the sequence or chain of behavioral events that culminates in thumb sucking is interrupted (e.g., Friman, 1988, 1990, 2000; Watson et al., 2002). Similarly, other studies have shown that eliminating thumb sucking, which appears as the first response in a behavioral chain (i.e., one behavior consistently preceded another), also eliminated hair pulling (e.g., Friman & Hove, 1987; Watson & Allen, 1993; Watson, Dittmer, & Ray, 2000). Conversely, Vorndran et al. (2008) found that decreasing hair pulling with behavioral intervention also decreased a child's untargeted thumb sucking.

Mahalski (1983) reported that as many as 50% of children who display thumb sucking also display attachments to transitional objects such as blankets, pillows, and dolls. In many of these cases, the child obtains one of these objects prior to engaging in thumb sucking. For example, Friman (1988) found that a 5-year-old girl only displayed thumb sucking when she was holding a doll; treatment involved simply withholding access to the doll. Follow-up assessment at 6 months posttreatment showed that thumb-sucking suppression was sustained in the absence of the doll.

Watson et al. (2002) also found that two typically developing brothers, ages 5 and 9 years, each engaged in thumb sucking while holding a pillow. Using a reversal design, Watson et al. found that removal of the 9-year-old's pillow decreased and ultimately eliminated thumb sucking for both participants. It appeared that the behavior of the older brother served as a model for the younger brother, whose thumb sucking abated without direct intervention when the older brother's thumb sucking stopped. For both children, the elimination of thumb sucking was maintained at 8 weeks posttreatment.

Friman (2000) evaluated the effects of presenting and withholding a transitional object (i.e., a surgical cloth) on the thumb sucking of a 3-year-old boy. The results showed that the

child only displayed thumb sucking when he had access to the cloth. Treatment involved attaching a pacifier to a cloth swatch. Thereafter, contact with tactile stimulation from the cloth swatch was associated with sucking of the pacifier. However, in the absence of a pacifier, the cloth evoked thumb sucking.

At least two behavioral mechanisms have been cited to account for reductions in thumb sucking following the removal of transitional objects and reductions in hair pulling following the elimination of thumb sucking. Friman and Hove (1987) speculated that decreased hair pulling following the elimination of thumb sucking is the result of interrupting a behavior chain or sequence. Alternatively, results of other studies indicate that some automatically reinforced behaviors may be more likely to occur in the presence of given forms of stimulation (Friman, 2000; Rapp, 2004; Rapp et al., 2004). Thus, the stimulation from hair pulling may be more reinforcing when stimulation from thumb sucking is present and vice versa (Vorndran et al., 2008).

These findings have implications for successful treatment of thumb sucking. In particular, when thumb sucking occurs primarily when an attachment object is present, the most efficient form of treatment may be to remove the object. In addition, if thumb sucking occurs in conjunction with another behavior, such as hair twirling or pulling, treatment of one behavior is likely to result in reductions in both behaviors. Therefore, intervention should be directed to the behavior considered easiest to treat or most amenable to change.

Consequent Interventions

Treatment procedures involving the punishment of thumb sucking have assumed three forms: response cost or the withdrawal of reinforcers contingent on thumb sucking (Baer, 1962; Knight & McKenzie, 1974), the application of an aversive-tasting substance to the thumb of the child (Friman et al., 1986; Friman & Hove, 1987; Friman & Leibowitz, 1990), or having the

child wear a device that delivers auditory stimulation when the child's hand is placed within 10cm of the head (Ellingson et al., 2000; Stricker et al., 2001, 2003). Response cost requires observation of the behavior and intervention by the parent while the latter two types of intervention provide consequences for thumb sucking in the absence of a parent or caregiver.

Response Cost

Baer (1962) demonstrated the effectiveness of response cost for decreasing thumb sucking with three 5-year-old boys. In baseline, Baer measured thumb sucking as each boy watched cartoons. During the response cost phase, cartoons were turned off while the boy's thumb was in his mouth and resumed when his thumb left his mouth. Response cost decreased thumb sucking for each boy. Knight and McKenzie (1974) also showed the suppressive effects of response cost on thumb sucking with three young children. In this study, adults read to the children at bed time; when thumb sucking occurred, the adult stopped reading, and when thumb sucking did not occur, the adult continued reading. Thumb sucking decreased for all three children. These studies suggest that thumb sucking that occurs during reinforcing activities with young children might be decreased with the contingent removal of the reinforcing activities.

Aversive Taste Treatment

Friman et al. (1986) evaluated the effect of Stop-zit, an over-the-counter substance that was specifically designed to reduce thumb sucking and other oral habits on the thumb sucking of seven children ages 4–12 years. Parents collected data each night by observing their child for 30 minutes after putting the child to bed. During the treatment, parents applied the solution once in the morning, once in the evening, and after each observed instance of thumb sucking. The treatment rapidly eliminated each child's thumb sucking. Furthermore, the parents of the children rated the intervention as highly acceptable. Likewise, as previously indicated, Friman

and Hove (1987) found that thumb sucking and hair pulling of two children, ages 2 years and 5 years, were both eliminated using an aversive-tasting substance applied to the thumb. Treatment effects were maintained at 10-month and 12-month follow-up assessments, respectively, without continued application of the aversive-taste solution. The results of the Friman and Hove study are significant in that treatment of a high probability behavior (thumb sucking) also decreased a low probability, though highly damaging behavior (hair pulling).

Contingent Auditory Stimulation

Researchers have also used contingent auditory stimulation via a battery-operated device to treat thumb or finger sucking. The AED is a two-component apparatus, which delivers a 65-dB tone contingent on the movement of the hand within 10cm of the head, with one part worn on the wrist and the other part worn on the shirt collar (Rapp, Miltenberger, & Long, 1998). Stricker et al. (2001) rapidly eliminated thumb sucking when using the AED with two typically functioning children. Stricker et al. found that the AED only suppressed thumb sucking when it was "active" (a tone was produced when finger sucking occurred) versus when it was worn but was "inactive" (no tone was produced when finger sucking occurred). As previously noted, Ellingson et al. (2000) found that the finger sucking of one child continued even when she wore two gloves. For this child, the addition of the AED to the glove intervention rapidly suppressed thumb sucking, and the child's parent gave high ratings of social approval for both the glove and AED interventions.

In one other study, Stricker et al. (2003) initially found that the AED was ineffective for decreasing the finger sucking of a 6-year-old girl. Subsequently, Stricker et al. augmented the effects of the AED by providing a 90-dB stimulus in conjunction with the 65-dB tone from the AED. The child's finger sucking was eliminated when the 90-dB stimulus was activated contingent on the behavior. Thus, although the device is labeled an "awareness enhancement device,"

it appears that the device achieves its effect through a punishment process; that is, the activation of the auditory stimulus contingent on thumb sucking serves to punish thumb sucking. Nonetheless, it has been rated high in acceptability by the parents of the children with whom it has been used (e.g., Ellingson et al., 2000; Stricker et al., 2003).

Procedures involving the use of contingent aversive stimulation (e.g., taste or auditory) may be limited to the extent that the child can remove the AED or the aversive tasting substance in the absence of adult supervision (see Watson & Allen, 1993). Thus, even though these interventions provide consequences for thumb sucking in the absence of change agent, supervision is still required to ensure that the integrity of the intervention is not compromised.

Combination Interventions

Several studies have evaluated the effects of habit reversal procedures alone (e.g., Christensen & Sanders, 1987) and in conjunction with other procedures (Long et al., 1999b; Rapp et al., 1999) to treat thumb sucking in children. In general, habit reversal involves (a) training the individual to detect each occurrence of the target behavior, (b) training the individual to engage in a physically incompatible competing response (e.g., putting hands in your pockets) contingent on the target behavior, and (c) enlisting social support from others to help the individual detect instances of the target behavior and to provide praise for engaging in a competing response. Although Christensen and Sanders (1987) showed that habit reversal substantially reduced thumb sucking for 30 children aged 4–9 years, several studies have shown that habit reversal alone is ineffective for decreasing the habit behavior of children younger than 7 years of age (Long et al., 1999b; Rapp et al., 1999) or individuals diagnosed with cognitive delays (e.g., Rapp et al., 1998; Long et al., 1999a).

Long et al. (1999b) found that habit reversal was ineffective for reducing the thumb sucking

and hair pulling of a 6-year-old girl. Subsequently, Long and colleagues implemented differential reinforcement and response cost procedures. While observing the child through a one-way window as she was seated alone in a room watching videos, the therapist entered the room and placed M&Ms in a transparent cup contingent on the absence of thumb sucking at the end of graduated time intervals. When this procedure did not eliminate the behavior, the therapist entered the room and removed M&Ms from the cup contingent on instances of the behavior. The combined reinforcement and punishment procedures decreased thumb sucking to near-zero levels which were maintained at periodic follow-up assessments occurring up to 36 weeks posttreatment. However, unlike previous studies (e.g., Friman & Hove, 1987), hair pulling decreased only slightly when thumb sucking was eliminated. Thereafter, the same procedures were implemented successfully to eliminate hair pulling.

Rapp et al. (1999) used habit reversal procedures to treat the thumb sucking of 5-year-old twin brothers. A pretreatment functional analysis indicated that both children engaged in thumb sucking when adults were absent but not when adults were present. The effects of treatment were evaluated in the home of the two children as they watched television without their parents present. Following training, the thumb sucking of one child decreased while the thumb sucking of the other child persisted. Subsequently, remote contingencies were implemented whereby the mother observed her sons' behavior when they were on the lower level of the home through a monitor that was set up in kitchen on the upper level. Any time thumb sucking was observed on the monitor, the mother called out for the child to stop sucking his thumb. In this way, the child learned that being alone no longer enabled him to avoid social consequences (punishment) for thumb sucking. Thus, for both children, thumb sucking only decreased when consequences (i.e., verbal reprimand) were delivered for the behavior and prompts

and consequences (i.e., praise from parents) were delivered for an alternative behavior.

An important finding from Long et al. (1999b) and Rapp et al. (1999) is that social contingencies can be successful in eliminating thumb sucking even when the behavior occurs exclusively when the child is alone. The child is likely to engage in the behavior while alone due to a history of punishment (scolding, reprimands) for having engaged in the behavior in the presence of the parents. If the scolding or reprimands are now delivered for thumb sucking when the child is alone, the behavior will decrease in this context as well. The implication for successful treatment is that the parent must be able to detect thumb sucking when the child is alone in order to deliver an immediate consequence for the behavior.

Summary and Recommendations for Future Research

Thumb sucking is a common childhood problem that can cause a number of problems when it persists beyond the age of 4 or 5 years. Intervention for thumb sucking begins with assessment of the behavior in the natural context and, subsequently, evaluation of treatment effectiveness within the same context. Prior to treatment, a functional assessment is conducted to identify or rule out any form of social reinforcement for the behavior. Although thumb sucking typically is maintained by automatic reinforcement (Rapp et al., 1999; Ellingson et al., 2000; Stricker et al., 2001, 2002), appropriate assessment will help isolate the context(s) in which the behavior occurs with greatest probability. Treatment for thumb sucking generally involves (a) antecedent procedures such as response prevention or treatment of covarying behaviors, (b) consequences such as aversive taste treatment, contingent auditory stimulation, or social punishment in the form of response cost or reprimands, or (c) some combination of procedures.

The Ellingson et al. (2000) study illustrates a number of important points regarding the assessment and treatment of finger sucking. First, treatment should be designed to address the function of the behavior when possible. Second, treatment should be implemented in the appropriate context (i.e., when the child is alone). Third, not all children will be equally responsive to intervention; use of more intrusive procedures should be reserved for those whose behavior persists when less intrusive procedures are used. Finally, treatment should be acceptable to the child and parent.

There are a number of potential avenues for further research into the assessment and treatment of thumb sucking. Future research should continue to evaluate environmental events that set the occasion for thumb sucking. Given that studies have shown that thumb sucking may increase in the presence of certain objects (e.g., Friman, 1988, 2000; Watson et al., 2002), research on how other forms of stimulation affect thumb sucking is warranted (e.g., Rapp, 2004).

Another area for future research would be further evaluation of the AED. Research should focus on generalization and maintenance of treatment effects produced with the AED, as well as procedures for ensuring that the child continues to wear the device in the absence of parental supervision. In general, many punishment procedures have been understudied (Lerman & Vorndan, 2002), perhaps because punishment generally is viewed as unacceptable (Miltenberger, Lennox, & Erfanian, 1989). However, based on the handful of studies conducted to date, the AED represents an acceptable, mildly aversive, harmless, and effective intervention for thumb sucking.

In addition to assessing caregivers' perceptions of behavioral interventions, Hanley (2010) provided guidelines for including the recipient of the intervention in the social validation process. In part, these guidelines include a methodology for directly testing the recipient's preference for one or more behavioral interventions. Therefore, more research is warranted on

the acceptability of interventions from the perspective of the parents and children who are treated for thumb sucking, both of whom are considered stakeholders (Hanley, 2010).

Another avenue for further research on the treatment of thumb sucking is the evaluation of remote contingencies to influence the probability of thumb sucking when the child is alone and, similarly, how parents could implement remote contingencies in the natural environment. Relevant to this discussion is the possible influence of inhibitory stimulus control whereby the presence of a salient environmental stimulus that signals punishment for a specific behavior exerts suppressive control over the target behavior. For example, studies have shown that stimuli, which were present when automatically reinforced problem behavior was punished, can produce at least short-term behavior suppression when punishment is not available (Rollings & Baumeister, 1981; Piazza, Hanley, & Fisher, 1996; Rapp et al., 1998, 2009; McKenzie et al., 2008; Anderson et al., 2010). Considering these findings, it is possible that providing reinforcement for alternative behavior in the presence of stimuli that inhibit thumb sucking may produce longer-term maintenance of treatment effects. As an example of this approach, a parent could provide praise to a child for keeping his hands in his pockets when he is wearing the "inactive" AED (or another stimulus that is discriminative for punishment).

Future research also should examine the effects of providing potential sources of competing stimulation, through the provision of highly preferred stimuli or environmental enrichment. Although the suppressive effects of competing stimulation on automatically reinforced problem behavior displayed by individuals with disabilities are supported in the literature (e.g., Goh et al., 1995; Piazza et al., 1998; Lindberg et al., 2003), this intervention, alone or in combination with other procedures such as response prevention and mild punishment, has not been formally evaluated to treat thumb sucking of typically functioning children.

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14

Management of Children's Distress and Disruptions during Dental Treatment

Keith D. Allen and Dustin P. Wallace

Key points

- It is often the real or perceived unpleasantness of the dental situation that generates a child's desire to escape; this leads, in turn, to distress and disruptive behavior.
- The key to good behavior management is the creation of a pleasant experience for the child by minimizing fear, anxiety, and discomfort.
- Dentists can control many variables that directly and significantly influence behavior through the use of clear communication, frequent praise, modeling, engaging distractions, and brief breaks.
- These strategies are also effective for children with special needs; however, these children may also benefit from additional preparation, and the dentist should consider physiological, developmental, and/or language differences.

Introduction

The skills required to manage a distressed and disruptive child during dental treatment are as fundamental to successful treatment as are handpiece skills and knowledge of dental materials. These skills are important because the ability to manage distress and disruptive behavior has direct implications for the quality of dental care. In addition, disruptive child behavior increases delivery time and the risk of injury to the child. Not surprisingly, behavior management with children is a topic of considerable interest for dentists.

There have been significant advances in dental technology, materials, and training that have made the dental experience for children more pleasing and enjoyable. Nevertheless, dentists must still be able to perform precise procedures on children who are distressed and disruptive (Sheller, 2004). Indeed, distress and disruptions continue to be prevalent and problematic within the child population (Bo, 2004). Although most children seen in clinical practice comply with the examination and treatment, estimates suggest that 20–25% of all children exhibit disruptive problems at the dental clinic (Raadal, Milgrom, & Weinstein, 1995; Brill, 2000). In addition, these problems are strongly correlated with age, where younger, preschool-aged children are more challenging than school-aged children (Allen, Hutfless, and Larzelere 2003). Furthermore, these problems are compounded when invasive procedures are required. For example, data from private practice suggest that the younger the child and the more threatening or invasive the procedure, the more often negative, disruptive behavior is observed (Brill, 2000).

Due to greater rates of disruptive behavior and noncompliance, some populations present particular behavioral challenges in the dental environment. As one example, preschool children can be so difficult to manage that many general practitioners are not willing to provide care for them when anything more than an examination or prophylaxis is required (Cotton

et al., 2001). This is of particular concern, given increasing interest in improving preschool children's access to dental care (Waldman & Perlman, 1999; Edelstein, 2000; Grembowski & Milgrom, 2000). Children with intellectual and developmental disabilities also have a greater potential for behavior problems in the office setting, causing some dentists to be unwilling to see these patients or to limit their practice (Salama, Kebriaei, & Durham, 2011). Perhaps as a result, children with intellectual and developmental disabilities start receiving dental care later than their typically developing peers (Chi et al., 2011). Unfortunately, these children have a great need for dental care, as they often have poorer overall oral health than typically developing children (Waldman, Perlman, & Swerdloff, 2001), and may have an increased need for dental care due to differences in oral physiology, medication side effects resulting in reduced saliva and increased caries, and potentially reduced compliance with home hygiene (Feigal, Jensen, & Mensing, 1981).

Why Children Are Disruptive

Changing child behavior during dental treatment requires understanding why children might be disruptive and noncompliant during dental treatment and also understanding how to help children learn more cooperative, new behaviors. Many variables have been considered by dentists in trying to understand why children are disruptive. For example, dentists have been concerned that permissive parenting styles have adversely influenced child behavior in the dental clinic (Casamassimo, Wilson, & Gross, 2002). Previous investigations have also explored general maternal anxiety, maternal dental anxiety, child anxiety, and child temperament as predictors of child disruptive behavior during treatment (Johnson & Baldwin, 1969; Radis et al., 1994; Quinonez et al., 1997). However, none of these investigations have identified reliable predictors of disruptive behavior in the dental clinic. Empirical studies

have been unable to identify a clear link between parent or child characteristics and disruptive behavior in the clinic. Even when investigators have sought to establish a more direct link between disruptive behavior in the dental clinic and disruptive behavior outside the clinic, none has been found (Dunegan et al., 1994). Finally, Allen et al. (2003) actually looked at parenting style in an effort to predict disruptive behavior in the clinic. They found that the only reliable predictor of disruptive behavior was, not surprisingly, age of the child. Younger children were more disruptive no matter what parenting practices were used. Older children were better, no matter what parenting practices were used. More importantly, no single parenting style was a predictor.

Although years of speculation have continued to suggest that factors outside the clinic are critically important, years of empirical research have indicated that outside influences do not seem to have reliably strong influences on disruptive behavior in the clinic. This should not suggest that outside or past influences have no impact at all; only that the impact is unpredictable. Perhaps more important is the fact that dentists have almost no control over these past or outside influences. One must question whether it is useful to continue to focus efforts on attempts to identify predictors over which dentists have little influence. Furthermore, there is every reason to believe that the variables that have the most direct and significant influence on disruptive behavior lie directly within the dental operatory and are variables over which dentists do have some control.

Consider for a moment the experience of a young child undergoing restorative dental work. The child must lie on their back, open their mouth, remain still, and have someone wearing a mask and gloves insert sometimes multiple instruments that make unusual noises, create unfamiliar sensations, and sometimes inflict discomfort or pain. Fear would be an expected reaction, especially in young children (2–5 years of age) where fear of strangers and strange situations, fear about separation from

their caregiver, and fear about noises, masks, and novel stimuli are common experiences (Barrios & O'Dell, 1998). But even in older children, there may be anxiety about a potentially unpleasant situation as children tend to overpredict the discomfort they will experience during treatment (Carlsen et al., 1993). That is, merely the anticipation of discomfort can evoke anxiety or fear. Furthermore, whether one appeals to anxiety, fear, pain, or a combination of all three, the fact that some children might be interested in escaping the dental treatment environment is not surprising. Of course, there are some children who are neither fearful nor anxious, but are merely oppositional because they find it unpleasant to be required to do something they wish not to do. Although these distinctions are very difficult to make in a brief dental visit (Harper & D'Alessandro, 2004), the distinction may not be critical to success, since the child's motivation remains the same: to escape an unpleasant (perceived or real) situation. For most children, efforts to escape involve verbal distress such as crying, moaning, or complaining, and/or behavioral distress such as flinching, blocking, thrashing, or turning away. Nevertheless, it is the real or even perceived unpleasantness of the situation that generates the motivation to escape, and it is the motivation to escape that generates disruptive behavior. It is not surprising then that there is a strong correlation between threatening invasive procedures and negative, disruptive behavior (Brill, 2000), and that these problems are more prevalent in younger children (see Fig. 14.1).

Of course, not all children view the dental experience as unpleasant. Still others may view the experience as unpleasant, but have learned to accept some unpleasantness in life without attempts to escape. Nevertheless, those who are disruptive are, in effect, communicating via their behavior that they find the experience unpleasant and that they would rather be elsewhere. The task of the dentist interested in behavior management then ultimately becomes one of reducing the unpleasantness of the dental experience. Indeed, were the dental experience

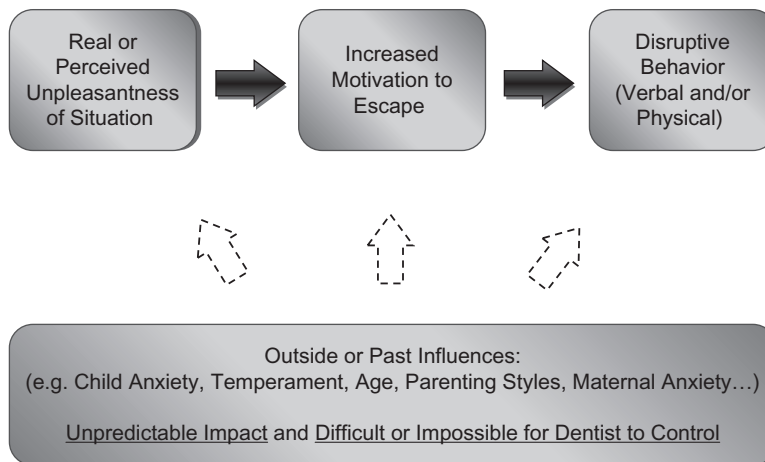


Fig. 14.1. Factors related to disruptive behavior in the dental office.

devoid of unpleasantness (whether from fear, anxiety, discomfort, or demands), the incidence of disruptive behavior would be markedly less if not nil. The goal then becomes one of reducing the unpleasantness or increasing the pleasantness of the treatment environment. The following approaches represent both time-honored and innovative methods of reducing the unpleasantness of the dental experience.

Positive Approaches to Behavior Management

Inherent in any behavior management approach is the requirement of time. Regardless of the approach, dentists who wish to learn and implement strategies designed to increase the pleasantness of the dental experience for a child must take time. Unfortunately, dentists are not reimbursed for time spent engaged in behavior management, nor are they reimbursed for learning those skills (Sheller, 2004; Glassman et al., 2009), so procedures must be easy to teach, learn, and implement in a busy clinical practice. Although some leaders in the field have challenged dentists who would be unwilling to spend “a few minutes shaping the behavior” of a disruptive child just because that time is not reimbursable

(Sheller, 2004), it is clear that interventions must be cost-effective. That is, dentists are most likely to use procedures that produce the most amount of benefit (i.e., improved behavior) with the least amount of time and effort (i.e., time and effort not associated with actual restorative dentistry).

More recently, dentists have also had to consider the risks associated with behavior management as part of the benefit analysis. Changing standards with respect to what constitutes “reasonable care” means dentists must be increasingly cautious about using behavior management procedures that parents might find objectionable (e.g., Bross, 2004; Oueis et al., 2010). Guidance from professional organizations also reflects this change, as the American Academy of Pediatric Dentistry has removed “hand-over-mouth” from its clinical guidelines, and clearly states that options such as protective stabilization, sedation, and general anesthesia only be implemented after consideration or failure of less invasive strategies (American Academy of Pediatric Dentistry, 2011). These views have largely been reflected in the educational and practice culture of pediatric dentists for some time; for example, most advanced programs no longer teach the hand-over-mouth procedure, viewing it as an unacceptable

behavior management technique (Adair et al., 2004), and most pediatric dentists do not employ the technique at all (Adair et al., 2004). As a result, this chapter will focus on techniques that appear reasonably benign, have some empirical support, and appear to be cost-effective.

Reduction of Discomfort

Certainly one way to reduce management difficulties in children is to explore strategies for reducing the pain and discomfort associated with invasive restorative dental procedures themselves. For example, numerous studies have been conducted in an effort to achieve a painless injection (e.g., Haupt et al., 1997), including the use of topical anesthesia and prolonged injection time (e.g., Maragakis & Musselman, 1996; Matthews et al., 1997). Prolonged injection time has been pursued as a means of reducing the pain associated with an injection, because it is understood that pain is created, at least in part, by the volume pressure changes exerted by the injected solution on small nerve fibers (e.g., Travell, 1955). Slowing the rate of administration may be one means of controlling the volume pressure. However, it can be technically difficult to achieve when done manually (e.g., Chan, 2001).

Several controlled investigations by Allen and colleagues with school-aged children explored the efficacy of a computerized local anesthetic delivery system, designed to reduce the pain of the injection by delivering anesthetic at a constant rate, pressure, and volume. Three well-controlled investigations demonstrated that, when used properly, a computerized system for slowing the rate of anesthesia administration and thereby controlling the volume pressure did result in children who were significantly less disruptive and who required less restraint to manage when compared with a traditional manual injection method (Asarch et al., 1999; Gibson et al., 2000; Allen et al., 2002). However, the computerized system took four times longer to administer an injection, and preschool-aged children became

restless with the lengthy injection duration. Some dentists may become restless too. Nevertheless, even though restless, the younger children were still significantly less disruptive. Although the computerized system clearly requires an investment in time at the beginning of the session, it may be well worth the time for some dentists, given the reduction of child disruptive behavior.

Parent Presence in Operatory

Dentists have long questioned whether having a parent present in the operatory is a reasonable approach to behavior management. Over 40 years ago, Frankl put the question to the test. In a nicely controlled scientific investigation, Frankl and colleagues demonstrated that preschool-aged children (3–6) were less distressed and disruptive when their parent remained in the operatory as a passive observer (Frankl, Shiere, & Fogels, 1962). Not surprisingly, this effect was strongest for the youngest children. Separating young children from their parents may introduce separation anxiety and thereby increase the unpleasantness of the visit. Subsequent studies of parental presence during dental procedures have repeatedly shown that parental presence has either no impact or a positive impact (e.g., Venham, Bengston, & Cripes, 1978; Pfefferle et al., 1982) on child behavior. Yet, surveys have demonstrated that many dentists are concerned that parental presence will disrupt the child (e.g., Marcum, Turner, & Courts, 1995). This concern is not entirely unfounded. Research has demonstrated that parents can negatively impact child behavior during injections if the parent frequently draws attention to and offers reassurance about the procedures. However, parents can actually be of help if they are instructed to talk with their child about nonprocedure-related topics (Gonzalez, Routh, & Armstrong, 1993). This might include talking about plans for an upcoming vacation, describing a recent experience with a pet or friend, or discussing favorite toys or activities. Results from these types of studies have led to recom-

mendations that dentists simply need to be sure to tell parents exactly what is expected of them (Harper & D'Alessandro, 2004). Research to date would suggest that parents be instructed to either remain silent or to talk about things unrelated to the ongoing procedures. These recommendations are important because significant numbers of parents want to be with their children, especially young children (e.g., Kamp, 1992; Peretz & Zadik, 1998).

Of course, dentists are concerned not only with the impact of the parent on the child, but also with the impact of the parent on the dentist. A parent in the operatory can create distractions and discomfort for the dentist (Marcum et al., 1995), who may feel more relaxed and comfortable when parents remain in the waiting room. Because dentists who are more relaxed and comfortable are more likely to perform better, many dentists allow parents in the operatory for the initial visits with a young, preschool-aged child, but subsequently ask that parents remain in the waiting room. This would appear to be a reasonable approach.

Modeling

Allowing a child to view other children who are undergoing dental treatment can both prepare them for what to expect, and provide a demonstration of appropriate behavior during the treatment (Kuhn & Allen, 1994). A number of studies have utilized videotaped models of children demonstrating good behavior and coping while experiencing dental treatment. Results have generally been quite positive, showing significant benefits, including reduction in disruptive behavior and anxiety-related behavior for children who viewed the tapes (e.g., Melamed et al., 1975, 1978). However, the use of video models has not been widely adopted by practicing dentists (Allen, Stanley, & McPherson, 1990; Wright, Giebartowski, & McMurray, 1991), perhaps due to financial or logistic challenges (Kuhn & Allen, 1994).

Another option is the use of live models, for example, via a clinic schedule that allows chil-

dren to first observe another child receiving dental treatment, and then serve as a model for the next child (e.g., Stokes & Kennedy, 1980). Interestingly, this line of research suggests that even for more invasive procedures, this strategy improves behavior for both the observer and for the model (Williams, Hurst, & Stokes, 1983). Overall, the empirical evidence suggests that school-aged children can benefit from observing peers and/or older siblings undergoing dental treatment showing "how it's done." Some dentists accomplish this through an "open bay" concept, in which children entering the treatment area readily see peers participating in dental exams. Other dentists schedule visits for entire preschool classes, where children can not only explore the environment, but also observe peer models who volunteer to sit in the chair, lie back, and allow the dentist to look in their mouths (Allen & Hosterman, 2011). So far, these techniques have not been routinely integrated into dental practices, perhaps due to financial, privacy, and/or logistic challenges. Nevertheless, there is evidence that video or live modeling contributes to improved behavior.

Effective Communication

The manner in which a dentist communicates with a child can certainly impact the pleasantness of the dental environment. This requires recognizing that children understand best when language is kept simple and concrete. This has commonly led to recommendations that dentists replace dental terminology with more easily understood words such as "raincoat" for rubber dam, "vacuum cleaner" for suction, and "tooth paint" for sealant (Wright, 2000). Table 14.1 includes a more comprehensive list of child-friendly terms for standard dental tools. Perhaps more important is to recognize that children learn best through experience. That is, children are active learners who learn best through direct interaction with the world. Indeed, the most effective educational programs for young children are ones that communicate concepts and ideas through experience (e.g.,

Table 14.1 Child-Friendly Terms for Standard Dental Tools

Dental tool	Child-friendly term
Mirror	Princess mirror, Tooth counter
Explorer	Tooth counter, checker, or toucher
Prophy angle	Tickly toothbrush, Princess toothbrush
Suction	Mr. Thirsty
Air/water	Mr. Windy, Squirt gun
High-speed handpiece	Mr. Tickly
Slow-speed handpiece	Mr. Bumpy, Motorcycle
Curing light	Blue flashlight
Etchant	Blue jelly, Tooth shampoo
Sealant/composite	Paint brush
Amalgam	Silver star, Crunchy snow

Weikart, 2002). Not surprisingly then, dentists have also traditionally valued communication that incorporates direct interaction and experience. Originally called the Tell-Show-Do (Addelston, 1959), this experiential technique involves describing for children, in simple terms, what is about to occur (Tell) and then allowing them to see, feel, explore, and manipulate the tools or instruments (Show), before beginning any procedure (Do). This might involve allowing the child to operate the chair, to squirt the water syringe, to feel the high speed on the back of their hand, or to use the suction to clean up a puddle of water. Although neither of these approaches (i.e., simplifying language, tell-show-do) has been empirically evaluated, each could reasonably be expected to increase the pleasantness of dental experience and both approaches are sensitive to children's developmental communication needs.

In contrast, using the delivery of commands in a loud rather than a normal voice has been tested as a strategy for enhancing communication with children. Dentists who, during operative procedures, delivered commands in a sudden, loud, firm voice (e.g., Stop!, Put your hands down), reduced disruptive behavior

more effectively than commands that were delivered in a normal voice (Greenbaum et al., 1990). This "voice control" technique has been described in textbooks for decades and is considered a viable alternative to "hand over mouth" by many dentists (Oueis et al., 2010). However, caution should be exercised when considering use of this approach to communication. It is not a technique that achieves benefits by making the dental environment more pleasant. Using voice control produces less disruptive behavior in children, not because the environment has been made more pleasant, but because the environment has, in fact, been made more aversive. Unfortunately, it is the interaction with the dentist that is aversive, and children are then motivated to escape or avoid the unpleasant interaction with the dentist. This may lead to improved behavior, but it may come at a cost to the dentist-patient relationship. In fact, voice control could be described as a punishment technique, and it may have "dysfunctional" side effects as a result (Greenbaum et al., 1990). Voice control does have a place in the behavior management armamentarium of the dentist, but always after more positive, benign approaches have been implemented and failed.

Distraction

A common approach to making the dental environment more pleasant is to distract the child with activities such as watching television, playing video games, or listening to music. This approach probably serves two functions. First, by engaging a child's attention toward alternative activities, children may be less likely to focus on dental procedures and any perceived discomfort they might experience. Second, these alternative activities are typically pleasant or even preferred activities, creating an environment that the child is less likely to wish to escape. Overall, scientific studies looking at the use of distraction procedures in the dental operator have yielded mixed results (Corah, Gale, & Illig, 1979; Coombs, 1980; Venham et al., 1981;

Sokol, Sokol, & Sokol, 1985; Havener et al., 2000). In large part, the differences seem to be related to whether the distractions are active or passive. That is, distracting activities that are passive (e.g., watching TV; have a pet nearby) may not be as effective (i.e., distracting) as those that are more active (e.g., playing a video game). Active distractions may hold the attention of a child better. However, active distractors may also disrupt or interfere with ongoing dental procedures. As a result, several attempts have been made to enhance the distracting potential of more passive activities.

One way to make a passive distraction activity more active is to require that the child must do something to be able to watch or listen to the distractor. For example, Ingersoll and her colleagues found that children's disruptive behavior could be reduced by making access to a distractor dependent upon cooperative behavior, as opposed to providing the child with unlimited access. Children were informed that they could listen to an audiotape or watch TV, but only as long as they remained cooperative. Each time the child became disruptive or uncooperative, the dentist immediately terminated the audio or video presentation and did not reinstate it until the child exhibited cooperative behavior. When dentists used this approach, the children were significantly better than when they had unlimited access. However, this approach required the dentist to control access to the distractors during the dental procedures which could potentially disrupt or distract the dentist.

Filcheck et al. (2004) used choice as a means of making passive distractions more active. They allowed children, prior to starting treatment, to peruse a large number of CDs and to select 2–3 CDs containing music and/or stories that they liked. The children wore headphones and then could change music tracks and even change CDs during the appointment with a handheld remote. This allowed the child to remain actively engaged while the dentist worked uninterrupted. In this case, children who had choice-based distraction were less

likely to be disruptive and were twice as likely to be considered very cooperative by the dentist (Filcheck et al., 2004).

More recently, investigators have found that video eyewear can serve as an effective distractor (Hoge et al., 2012). Video eyewear involves wearing goggles that are connected to a DVD player, allowing the individual wearing the eyewear to watch a movie or TV show on small video screens inside the goggles. Hoge et al. found that children who wore video eyewear to watch DVDs that they had selected were significantly less disruptive and more satisfied with treatment than children who did not wear video eyewear. Although this approach involved primarily passive distraction, it may strengthen the distracting value of the movie or TV show by bringing the picture closer to the viewer's eyes and by screening out other sights and sounds in the operatory.

In conclusion, the evidence would suggest that providing children with distractors can be an effective strategy. Not all distractors, however, are equally effective. Passive distractors that require nothing from the child appear to provide little benefit. The exception may be video eyewear, which was both effective and pleasing to those who used it. More active distractors that require some participation from the child appear to offer significant benefit. This active distraction might be as simple as allowing children to change the channel on a TV with a remote during treatment. This type of approach is relatively inexpensive and quite easily implemented with little or no disruption of the operative procedures. This makes active distraction one of the most cost-effective options available for improving the pleasantness of the environment and reducing disruptive behavior.

Reinforcement of Good Behavior

It is now widely recognized that children who receive positive feedback about their behavior are more likely to repeat those behaviors again. Feedback can take the form of praise, attention, touch, rewards, treats, or even privileges, and

those who regularly work with children often use these strategies to encourage and reinforce children for appropriate behavior. Although some experts have challenged the use of reinforcement, arguing that it may rob children of their intrinsic motivation and teach them to expect rewards for behavior they should be doing anyway, there is little empirical support for this concern. Perhaps more important, reinforcement has been shown to be important for teaching new and desired appropriate behaviors.

Whether it is a parent, teacher, coach, or dentist, the most easily accessed and delivered form of reinforcement is praise. Praise is most effective when it describes very specific behaviors (e.g., "I like how you are sitting so still with your hands in your lap"; "It is such a big help to me when you hold your mouth open like that!"). Using specific praise has been found to be an effective means of promoting good behavior in a wide variety of settings and with a wide variety of providers, including dentists. Specifically, children who receive immediate and specific reinforcement from dentists most consistently show reductions in fear-related disruptive behavior (Weinstein et al., 1982a). Likewise, even physical touch can be an important source of reinforcement and has been found to help reduce fidgeting and disruptive movements and result in children who find the dental visits more pleasant (Greenbaum et al., 1993). Unfortunately, some children do not offer much good behavior for the dentist to praise or acknowledge. In these cases, finding even small approximations of good behavior to praise and reward is important both for shaping new behaviors and also for making the environment positive. Although it is easy to slip into negative reprimands and threats in response to disruptive behavior (Weinstein et al., 1982b), these risk increasing the unpleasantness in the dental operatory and escalating the likelihood that the child will try to escape. Although reprimands and negative verbal feedback cannot always be avoided, investigations of child behavior in other settings such as classroom and clinics

suggest that children who experience four positive, reinforcing interactions for every one negative interaction exhibit more cooperative and less disruptive behavior (Table 14.2).

Scheduled Breaks

Dentists have long recognized that giving children a sense of control is an important strategy in helping them cope with dental procedures. For example, to allow a child to raise a finger or hand and stop treatment when they experience discomfort is one way that dentists can give children a sense of control and improve the pleasantness of the dental experience. However, hand-raising is not the only behavior that a child might use to gain a sense of control. Disruptive behavior can also give children a sense of control because it too can result in the dentist stopping the dental procedures. This is important to recognize because escape from unpleasant or undesirable situations is one of the most common and powerful sources of motivation for children, and it plays a major role in a wide variety of problem behaviors including tantrums and other disruptive behavior. Efforts to escape unpleasantness (i.e., thrashing, blocking with hands, turning head, crying) are natural responses that are, in fact, much more likely to occur than raising one's hand. Unfortunately, the dentist's natural tendency to stop treatment in response to disruptive behavior may, in many cases, serve to encourage that behavior because of the control it offers.

One management procedure takes advantage of the powerful motivation that comes with escape. The approach uses escape to teach more cooperative behavior (Allen & Stokes, 1987, 1989; Allen et al., 1988, 1992). It is an adaptation of existing management techniques (e.g., raising the hand) that allows the child some control over the dental routine. In this procedure, brief periods of escape from ongoing dental treatment are provided, contingent upon cooperative behavior. Instead of raising a hand, the child can receive brief escape (5–10") from dental treatment by lying very still and quiet.

Table 14.2 Behavioral Strategies to Prevent and Reduce Disruptive Behavior

Strategy	Pros	Cons	Tips
Slower or computerized injection	Reduces pain due to volume changes; improves child behavior	Best results require lengthy injection duration; may lead to restless children or dentists	Reducing pain during this initial moment of a visit and during the most invasive procedures may be well worth the added time
Parent presence	Parents may prefer this, and nonprocedure-related talk generally does not lead to disruptive behavior	Parent presence often leads to more disruptive behavior and can make dentists less comfortable as well	Generally ask parents to remain in waiting area; consider allowing parents to be present for preschool children
Modeling	Either with video or live modeling, children show less disruptive and anxiety-related behavior	There may be financial, logistic, and/or privacy-related barriers to implementation	Have an "open-bay" clinic; schedule preappointment visits without planned cleaning or procedures, invite a peer or sibling to model good coping
Effective communication	Increases pleasantness for child and allows learning through words and experience	Requires extra time, not empirically validated	Use Tell-Show-Do and developmentally appropriate terminology
Voice control	Effectively reduces disruptive behavior	Makes dental environment less pleasant and may have undesired side effects	Use voice control sparingly, and only after other techniques have been attempted
Distraction	Increases pleasantness of environment and reduces child attention to dental procedures; requires little extra time	Requires equipment, and some simple "passive" distraction methods appear to have little benefit	Give child some control, such as over volume, channel, or choice of CD or DVD
Reinforcing good behavior	Specific, labeled praise is effective and takes little time	Good behavior does not catch attention as quickly as disruptions; some children exhibit "good" behavior rarely	Find opportunities to praise even "ok" behavior if child has little "good" behavior; target four praises for every reprimand
Scheduled breaks	Using scheduled breaks improves overall behavior; does not increase overall appointment length	Requires frequent breaks, sometimes when it is inconvenient	Consider regular use of scheduled breaks in populations with increased likelihood of problem behavior (e.g., young children or those with special needs), and as needed for other children

Any disruptive behavior by the child delays escape until cooperation is regained. Research with very disruptive children has demonstrated that this approach was able to dramatically improve child behavior in a relatively short amount of time. Interestingly, children as young as 3 years old, considered by some dentists to be "precooperative," were nevertheless able to learn very cooperative behaviors. Observations suggest that early in treatment, when very young children are provided with brief opportunities to escape, it prevents gradually escalating disruptive behavior later on.

This "contingent escape" approach is based on well-established learning principles and is designed to not only diminish undesirable behaviors, but also to increase desirable behaviors. The contingent escape approach provides immediate feedback to children to teach them which "in-chair" behaviors are mostly likely to lead to breaks from treatment. Children learn how to control the situation by being cooperative, still, and quiet, rather than disruptive and uncooperative, which results in no escape. Of course, this approach raises immediate concerns about cost-effectiveness. A dentist who frequently stops treatment is potentially delaying the completion of treatment. However, these studies have shown that offering children brief escape takes no more time away from restorative procedures than does the time and effort devoted to dealing with the disruptive behavior when the breaks are not used. Of more concern, however, is the demand the procedure places, not on the dentist's time, but on their concentration and attention. The approach requires the dentist to continuously notice cooperative behavior. This is not easily achieved. As with most adults, noticing and responding to problem behavior comes much more easily than noticing and responding to appropriate behavior.

In an effort to reduce the demand on the dentist, Allen and colleagues modified the procedure to eliminate the requirement that the dentist monitor child behavior. Instead, they arranged for the brief breaks to be delivered based on time rather than based on child behav-

ior. In this approach, the pleasantness of the dental environment is enhanced by simply making frequent brief breaks a regular part of the procedure, independent of how the child behaves. In this way, the dentist is freed from the need to monitor child behavior. The dentist wears an electronic prompter (MotiVator®, Behavioral Dynamics, Inc.) that signals to the dentist when a break is due. This approach has proven to be as effective as the contingent procedure in reducing disruptive behavior, again with very young children (O'Callaghan et al., 2006). Subsequently, Allen and colleagues tested this approach with a large randomized sample of preschool and school-aged children and found that the use of scheduled breaks resulted in significantly fewer physical and verbal disruptions, and less need for restraint across a variety of dental procedures such as fillings, crowns, and extraction (Allen & Wallace, in press). Furthermore, while dentists using the strategy did provide frequent breaks, the overall dental appointment was no longer than the control group where no scheduled breaks were provided, likely because the improvements in behavior resulted in more efficient work during work periods.

Children with Special Needs

Children with special needs (e.g., intellectual or developmental disabilities, including autism spectrum disorders) may have an increased need for dental care due to differences in oral physiology, medication side effects resulting in reduced saliva and increased caries, reduced compliance with home hygiene, and increased use of sugary snacks or treats (Feigal et al., 1981; Waldman et al., 2001). At the same time, the increased potential for behavior problems, lack of training or experience, and inadequate reimbursement for services cause some dentists to be unwilling or unable to see these patients (Salama et al., 2011; Vainio, Krause, & Inglehart, 2011). These factors likely contribute to the finding that children with intellectual and

developmental disabilities start receiving dental care later (Chi et al., 2011) and have poorer overall oral health than typically developing children (Waldman et al., 2001). Nonetheless, with few modifications, many of the strategies already discussed are effective for preventing or reducing disruptive behavior in this population. The following represent a few considerations when working with children who have special needs.

Preparation

Preparation for the dental appointment is important for all children (Allen & Hosterman, 2011), but even more so for those with special needs. Dentists may encourage parents to have their children “practice” some of the skills required in the dental office, such as keeping the mouth open for a period of time, sitting in a reclined position, or wearing sunglasses. Also, scheduling an initial previsit without any scheduled work may allow the child to become accustomed to the dental office with fewer behavioral demands. Some parents may help prepare their children for a dental visit with the use of social stories or visual schedules which help children understand what to expect during the visit.

Developmental and Verbal Level

Children with special needs may or may not have similar cognitive or verbal abilities to their same-aged peers. It is important to ask parents about their child’s abilities and about communication strategies that have worked in other medical settings. Dentists should also be aware that ability to speak, or lack thereof, is separate from the ability to understand language and also does not predict other cognitive or motor abilities.

Differences in Gag Reflex

Due to oral hyper- or hyposensitivity, some children with special needs may have differences in

the gag reflex. It may be difficult to predict what challenges may be pertinent for any particular child. Dentists should be flexible and willing to experiment with the use different flavors of toothpaste or fluoride, and adaptable with the use of dental tools (e.g., using manual toothbrush if child is bothered by prophylaxis angle).

Desensitization

Regardless of how much preparation a dentist may do to make the treatment environment more pleasant and comfortable, unfamiliar stimuli can elicit considerable fear and distress in individuals with developmental disabilities. Intense and unfamiliar sensory experiences, like those experienced at the dental clinic, can heighten this fear and anxiety. As a result, some children may require more gradual exposure, sometimes warranting more than one “getting-to-know-you” visit to build familiarity with staff and the dental environment before attempting treatment. Evidence suggests that this process of gradually exposing some individuals to the dental environment across a number of visits can “desensitize” them to the stimuli and reduce distress (e.g., Boj & Davila, 1989; Conyers et al., 2004).

For Additional Information

A thorough review of the area is beyond the scope of this chapter; however, more comprehensive treatments of the area are available (e.g., Cuvo, 2011). Also, Autism Speaks has recently published two comprehensive guides with tips and recommendations for providing dental services for individuals on the Autism Spectrum. One guide is written for parents and provides information about home dental care, preparing for a dental appointment, and also how to use strategies designed for this population to improve behavior during a dental appointment (Autism Speaks Autism Treatment Network, 2010). Another guide is specifically for dental providers (Autism Speaks Autism

Treatment Network, 2012). Both of these guides are available online at no cost (from <http://www.autismspeaks.org> or see references for direct link to resources).

Conclusions and Recommendations

Good behavior management starts with recognizing that the key to success resides in the creation of a pleasant experience for the child. Although outside influences such as parenting and previous experiences may have some impact on some children, the most potent sources of influence lie directly within the dental operatory and are under the control of the dentist. Although much has been done and continues to be done to reduce the pain and discomfort associated with restorative dentistry, the dental operatory can still be experienced as unpleasant. Children's perceptions of unpleasantness are important sources of distress and must be acknowledged and addressed. Years of research and experience would suggest that to create a maximally pleasant experience for children and reduce the likelihood of disruptive behavior, the approaches described in Table 14.3 make sense.

The emphasis here on nonpharmacological methods derives, in large part, from calls for greater promotion of these methods (Ng, 2004). Changing attitudes about the acceptability of some traditional management techniques have made the search for effective alternatives more salient and the need to establish training competencies more urgent. Fortunately, there are a number of reasonable techniques that offer benign, low-risk, empirically supported approaches. Each of these strategies appears relatively easy to implement with minimal training or cost in terms of money or time. Perhaps more importantly, however, is that each has the potential of making the dental experience more pleasant for both the child and dentist alike.

Table 14.3 General Summary of Recommendations

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- Use topical anesthetics and slow injection rates to reduce procedural discomfort.
 - Allow parents of young children to accompany them in the operatory, with requests for silent participation by parents or that they limit their discussions to nonprocedure-related topics.
 - Consider taking advantage of peer modeling, for example, by having an "open bay" clinic setup, allowing children to observe peers or older siblings undergoing dental treatment, and/or scheduling visits for preschool classes to allow children to explore the environment and observe peer models having a mock dental cleaning or procedure.
 - Offer pleasing distractions. The operatory itself should be equipped with either a TV/DVD combination unit or stereo unit or perhaps video eyewear for which children could select, in advance, DVDs or CDs of their choice. Children would be able to scan the DVDs or CDs throughout the visit, providing them with some control and choice. Headphones would be available to wear for either the TV or stereo to help attenuate operatory sounds and enhance listening ability.
 - Communication should be kept relatively simple and positive, focusing praise on observed cooperative behavior. Efforts would be made to make three to four times more positive comments to each child than negative, directive, or controlling comments. Threats or promises about either negative or positive consequences to come at the end of the visit would be kept to a minimum, recognizing that, in this type of situation, children live for the moment, not the future.
 - Brief breaks should be offered frequently, regardless of how the child behaves, although additional breaks based on cooperative behavior can be effective too.
 - These strategies are also effective for children with special needs; however, they may benefit from additional preparation for the appointment, and it is important to consider physiological differences (e.g., gag reflex) as well as developmental and/or language differences.
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15

Stress, Coping, and Periodontal Disease

Gernot Wimmer and Walther Wegscheider

Key points

- Stress may have a negative impact on general health.
- It has been assumed that psychological stresses and psychosocial factors may play a role in the development of chronic diseases like periodontitis.
- Individual stress coping strategies may exert influence on the onset, development, and severity of periodontal disease.
- Inadequate stress coping strategies might modulate the impact of stress and may be considered as potential risk factor for periodontal disease.

Introduction

Periodontitis is a biofilm-associated chronic inflammatory disease of the supporting tissues of the teeth primarily caused and initiated by specific periopathogenic microorganisms and

their metabolic products (Socransky & Haffajee, 1992; Page & Kornman, 1997). Epidemiological studies indicate several so-called risk factors that may be closely related to the emergence, severity, and progression of periodontitis (Genco, 1996). On the one hand, susceptibility

to the disease may be increased by inherent biological conditions and, on the other hand, factors influencing the disease may be acquired in the course of one's life and render a primarily resistant individual susceptible to the disease (Genco & Löe, 1993). Of the immanent factors, mainly genetic factors like polymorphisms and gene mutations, are those that influence the immune system and are associated with a harmful progression of the disease (Kornman et al., 1997; Laine, Crielaard, & Loos, 2012). In addition to systemic diseases like diabetes mellitus (Lalla & Papapanou, 2011), unfavorable forms of behavior such as smoking (Walter, Kaye, & Dietrich, 2012), diet (Kaye, 2012), or individual oral hygiene may be related to the pathogenesis and development of periodontal disease. Following some earlier research by Giddon (Goldhaber & Giddon, 1964; Giddon, 1966) and the summary of prior studies (Giddon, 1999), it has been assumed that psychological stresses and psychosocial factors play a role in the development of periodontal disease. It is also suspected that stress enhances the individual's susceptibility to periodontitis (overview studies by Ballieux, 1991; Monteiro da Silva, Newman, & Oakley, 1995; Breivik et al., 1996; Monteiro da Silva et al., 1998; Solis et al., 2004). The mechanisms by which psychological strains, psychosocial factors, or individual internalized physiological changes and/or behavior in response to stress influence the initiation or progression of periodontitis are nearly unknown and remain hypothetical. Two models are discussed on how stress mediates increased susceptibility to periodontal diseases (Genco et al., 1998): First, stress-mediated activation of the hypothalamic-pituitary-adrenal axis promotes secretion of the hypothalamic hormone called corticotrophin-releasing hormone (CRH), which in turn stimulates the pituitary to release the hormone adrenocorticotrophic hormone (ACTH). ACTH stimulates the adrenal cortex to secretion of glucocorticoids, like cortisol, which has suppressive effects on immune system (Salvi et al., 1997). Additionally, stress-mediated stimulation of the autonomic nervous system

promotes the adrenal medulla to secretion of catecholamines, such as adrenalin and nor-adrenalin. Catecholamines promote formation of tissue destroying prostaglandins and proteases. Second, behaviorally, promotion of health-damaging behaviors, such as smoking, neglect of oral hygiene, and unhealthy, fatty food intake, leads to an aggravation of periodontitis (LeResche & Dworkin, 2002). Psychosocial factors, such as occupational stress, quality of relationships, strains because of being jobless, and amount of stressful event in a certain period, can be manifested in a depression. Such factors promote the development and progression of a periodontitis. Causality of this association is the promotion of unhealthy behaviors, such as smoking, neglect of oral hygiene, consumption of alcohol, unhealthy food intake, and physical inactivity (Sheiham & Nicolau, 2005). In regard to these two mechanisms, the influence of stress on periodontal wound healing is discussed (Boyapati & Wang, 2007).

In this chapter in particular, the influence of individual stress coping strategies upon the emergence, progression, and treatment of periodontal disease will be investigated, and clinical implications thereof will be discussed.

Studies on Stress Coping

The majority of stress-relevant studies dealing with the impact of stress on oral conditions try to establish an association between the influence of various psychological and psychosocial stresses and their potential disease-producing outcomes (Stanford & Rees, 2003). However, they do not consider individual reactions or responses to such stresses. The mode of confronting stressors and dealing with them or the efforts made to overcome difficulties, stress, and stressful situations is termed coping. The manner in which individuals cope with stressful events is, according to Lazarus (1966), more important for their psychological and physical well-being than the frequency and severity of the stressors as such. Either consciously or unconsciously, individuals

use coping measures as a response to stress in order to reduce its intensity or to overcome stress altogether. In a large cross-sectional study, Genco et al. (1999) found that psychosocial stress factors in conjunction with financial worries are significant risk indicators for adult periodontal disease. Furthermore, the authors point out that adequate coping behaviors, as evidenced by high levels of problem-based coping, may reduce the stress-associated risk. The results of this study justify the assumption that the individual concept of stress coping is especially significant and that inadequate stress coping strategies might modulate the impact of stress on periodontal disease. Psychosocial variables, such as amount of strains and stress coping strategies, are potential risk factors for development and progression of a periodontitis (Heitz-Mayfield, 2005).

Coping with Stress: Its Influence on Periodontal Disease

Using a stress coping questionnaire, the coping patterns used by patients with existing periodontal disease to react to specific stressful situations were determined; that is, do patients with periodontitis have specific stress coping strategies that differ from the coping strategies of periodontally intact controls (Wimmer et al., 2002)? For a psychodiagnostic registration of data concerning stress coping, all persons answered a stress-coping questionnaire (SVF) consisting of 114 questions which included a total of 19 actional and intrapsychic stress coping modes (Janke, Erdmann, & Kallus, 1985). Each of these 19 subtests was optionalized with 6 questions. Activity-related coping included behaviors which signify attack, escape, social contact, withdrawal, and so on, that is, all strategies that aim to actively alter the stressful situation or one's own reaction to it. Intrapsychic strategies are processes such as perception, thinking, imagination, and all motivational-emotional processes, for example, distraction, devaluation, denial, and overestimation of one's own resources.

The test instrument (stress questionnaire) had the following three features: (1) The 19 subtests provided a very detailed documentation of stress coping measures, which made the test different from other instruments that attempt to study stress coping on the basis of a single dimension or a few dimensions. (2) The questionnaire also contained questions about "stress-enhancing" strategies such as "social isolation," as it is assumed that the measures used by the individual do not only "reduce" stress but may also aggravate it. (3) The questionnaire did not address cognitive strategies alone, but also recorded behavior-oriented strategies such as "escape," "avoidance," and "pharmaceutical drugs." The respondent was repeatedly confronted with one and the same statement: "When I am thwarted, inwardly upset, or made to lose my balance by something or someone. . . ." This statement was followed by various items such as "I visit pleasant friends or acquaintances" or "What I'd like to do most is run away." The five-point Likert-scale answers ranged from "0 = not at all" to "4 = very likely." t-Transformed scale values were then calculated from raw data to permit comparisons with the random sample used for standardization. Using a factor analysis, 5 factors that strongly correlated with each other were extracted from the 19 subtests (Table 15.1).

Factor 1 was termed resigned coping and included the following subtests: avoidance, escape, social withdrawal, resignation, self-pity, and rumination. Factor 2 comprised the subtests response control, situation control, positive self-instruction, and minimization, and was termed active coping. A similar degree of charge was found for the subtests in the extracted factor 3, which was termed distractive coping. The subtests for this factor were distraction, search for self-affirmation, substitute gratification, and need for social support. Factor 4 was termed defensive coping and included the following subtests: averting blame, accusation of self, and playing down in comparison with others. For the subtests aggression and drug use, no association with other factors was found.

Table 15.1 Extracted Factors after Factor Analysis

Factors	Subtests
Factor 1 = resigned coping	Avoidance, escape, social withdrawal, resignation, self-pity, rumination
Factor 2 = active coping	Response control, situation control, minimization, positive self-instruction
Factor 3 = distractive coping	Distraction, search for self-affirmation, substitute gratification, need for social support
Factor 4 = defensive coping	Averting blame, accusation of self, playing down in comparison with others
Factor 5 = coping with aggression and drug use	Aggression, drug use

Therefore, these two variables were summarized as factor 5 and designated accordingly. Factors 1 and 2 describe active problem-oriented coping strategies while the factor groups 3 and 4 (5) describe passive emotion-oriented coping.

Statistical evaluation revealed that, in the present study, the stress coping behavior of patients with periodontitis differed from that of controls in regard to stress coping strategies. Patients had significantly less loading for factor 2 (active coping) than did controls. In other words, patients used active stress coping strategies to a lesser extent than did controls. On the other hand, patients had a higher loading for factor 3, namely, "distractive coping," than did controls. Thus, when patients lose their equilibrium, they tended to be distracted, reward themselves with substitute gratification, or seek support from others. Patients with periodontitis also had the highest correlation with factor 4 (i.e., defensive coping); that is, patients tended to cope with stress situations by "averting blame." "I have done no harm" is a typical item for this strategy. Accordingly, "accusation of self" was less pronounced. "Playing down in comparison with others" ("I take such situa-

tions more lightly than others do") sums up the image of an extenuating coping pattern that only provides temporary relief. The last extracted factor, factor 5, consists of 2 subtests: "drug use and aggression." This category of behavior was treated as a separate factor in the present study, as neither of these aspects could be assigned to the other factors. This factor permits the cautious conclusion that the test group tended to counteract their aggressive irritation by means of tranquilizers more than the control group.

The potential effect of different coping strategies on attachment loss within patients with periodontitis was then evaluated. The amount of clinical attachment loss (CAL) was used to classify the severity of periodontal disease. The mean loss of clinical attachment was calculated for each patient. According to their CAL, the patients were divided into two groups: slight = 1 or 2mm CAL and moderate = 3 or 4mm CAL constituted patient group 1, while severe = ≥ 5 mm constituted patient group 2. An evaluation of the association between individual coping styles and the severity of disease showed that factor 4, "defensive coping," played an important role. Periodontitis patients with a defensive coping style had significantly greater CAL. This finding was further emphasized by an increasing factor value in conjunction with increasing CAL. Thus, in stressful situations, these patients were more inclined to decline all responsibilities and tended to compare themselves to others with a view to enhancing their own importance ("Others would not digest it so easily"; "I have much better control over that than others do in the same situation"; "I'm still able to calm down and take control of myself much faster than others"; "I'm glad I'm not as sensitive as others"). At the same time, they tended to reject self-accusation much more than control persons ("I can't help it"; "That situation is not my responsibility"; "I've done no wrong"). This coping style is indicative of a strongly defensive attitude and a marked resistance to agitation and risks caused by external factors, which, in

terms of a psychoanalytical defense mechanism, are a major threat for the individual's personality. The threat is perceived with fear and must be warded off, which causes the person not to experience nervous agitation in the first place. In a stress situation created in the laboratory by way of a lecture in front of alleged language experts, the subtest "playing down" (reducing in importance) correlated negatively with subjective stress reactions. In the repression-sensitization stress concept (Krohne & Rogner, 1982), it is assumed that individuals who are of the repressor type tend to ward off threatening information and stimuli because of a marked tendency toward fearfulness, while sensitizers need more stimuli. It is these features of coping, which are of immense importance in guiding the patient, educating him or her about the disease, and administering therapy and posttreatment.

In summary, the results of the present study showed that patients with periodontal disease confront stressful problems in different ways. Compared to healthy controls, they use a number of different coping strategies. Patients used active problem-oriented coping styles significantly less often; rather, they employed passive emotional stress strategies like distractive coping and defensive coping to resolve problems. The study also showed that the progression of disease, measured by the CAL, was correlated with these inadequate coping strategies. In other words, periodontitis patients with a defensive coping style had significantly more CAL. Furthermore, the tendency toward an increasing CAL was emphasized by concomitant increasing values in coping strategies.

Coping with Stress: Its Influence on Periodontal Therapy

The role of inappropriate coping styles as a risk to the general health of an individual is considered to be important for the emergence of disease and its progression; the same is true for the impact of such coping styles on the severity of disease. To investigate such a modulating

effect on therapy and the course of disease, the influence of the patients' individual coping behavior (which had been recorded by psychodiagnostic procedures as described earlier) on a nonsurgical periodontal treatment and the subsequent course of the disease for 2 years was tested (Wimmer et al., 2005). The clinical and psychodiagnostic data of the first investigation were used as baseline data and were compared with clinical as well as new psychodiagnostic data obtained after the completion of periodontal therapy and posttreatment 2 years later. During this period, all patients underwent identical nonsurgical periodontal therapy and posttreatment maintenance.

The analysis of data indicates a negative influence of that coping strategy which correlated with the extent of disease at the initial investigation. Defensive, suppressive coping was statistically significantly correlated with CAL. Periodontitis patients with a defensive coping style had significantly greater attachment loss at the 2-year evaluation compared to patients with other coping behaviors. Furthermore, the percentage reduction of CAL ≥ 4 mm was significantly less in defensive copers. The less the patients used these presumably inadequate coping strategies, the greater was the percentage increase in sites with attachment loss below 4 mm, that is, improvement of the disease (Fig. 15.1). Conversely, an increase in defensive suppressive coping was associated with a lesser reduction in the number of severe disease sites. Those patients who largely used this inadequate "poor" coping strategy had a greater percentage of sites with advanced CAL; thus, the improvement of the disease was inhibited. In addition, patients with a defensive coping style had significantly more sites with severe attachment loss. Thus, patients who belong to the group of the "more strongly defensive and suppressive copers" were at greater risk of experiencing more CAL after 2 years compared to those using other stress coping strategies. If the response to nonsurgical treatment was the same, one would expect a similar percentage reduction of deep pockets among patients with different coping

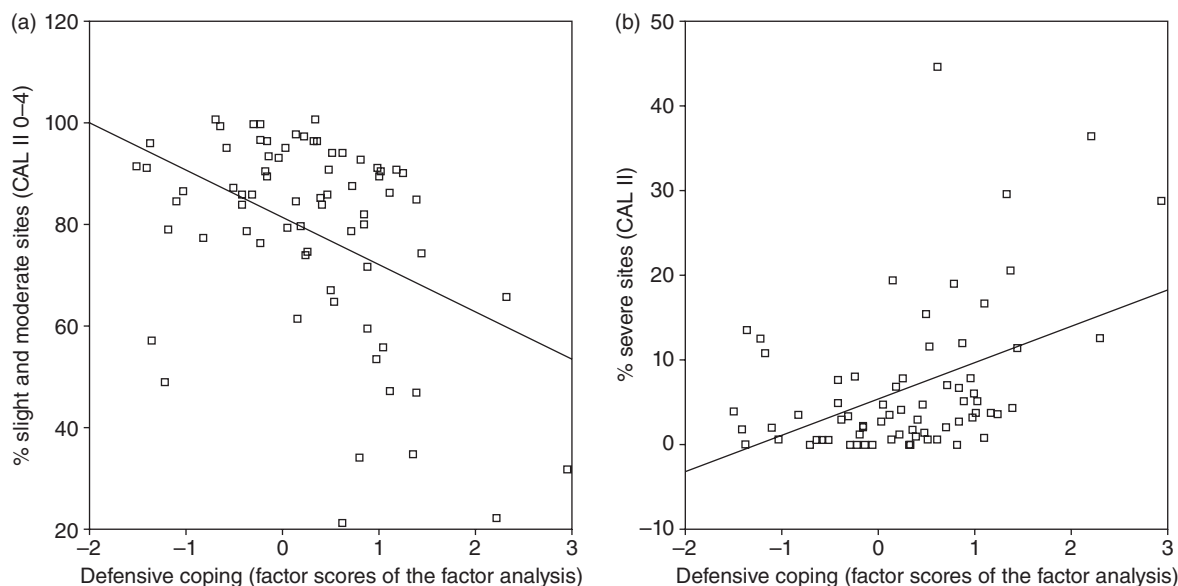


Fig. 15.1. Significant correlations ($p = 0.0001$) between defensive coping (factor 4), reduced number of slight and moderate sites (AV 0-4), and increased number of severe sites.

strategies. These correlations of different stress coping strategies with the extent of periodontal destruction from the first and the second investigation may be interpreted as follows: a defensive suppressive coping style may have a negative impact on the development of the disease as well as its course and treatment.

In this context, the relation of the results for the 19 individual subtests of the SVF (Table 15.1), those addressing stress coping measures indicated by responses to six questions each, or changes in these subtests over time, to changes in periodontal status was determined. By doing so, an attempt was made to identify the different strategies used by patients in stressful situations and the outcome of such strategies. Very few strategies were altered during the study period. Most remarkably, the subtest drug use was highly significantly correlated with the CAL. Drug use in the baseline survey as well as changes of the subtest drug use were correlated with less improvement in clinical parameters.

In addition to drug use, averting blame and playing down in comparison with others also

showed changes, although not to such a significant degree. Averting blame, playing down in comparison with others, and drug use are coping strategies which do not permit active confrontation of the stressful situation. A habitual preference for a nonconfronting stress coping style is possibly responsible for an unfavorable course of the treatment and the disease in the long term. High factor values in the subtest of drug use are indicative of strategies to indirectly avoid or reduce the stressful situation or reaction. In stressful situations, patients tend to use pharmaceutical agents, such as drugs, psychotropic stimulants, or so-called substitute gratification to a greater extent. The typical items of this subtest are as follows: "I tend to smoke much more or start smoking again"; "I take tranquilizers"; "I tend to get drunk"; "I first drink a glass of beer, wine, or schnapps"; "I take sleeping tablets"; "I tend to take medication of some kind." Substitute gratification also includes nicotine, alcohol, or drug abuse. Smoking is considered to be one of the most important predisposing behavior-

oriented risk factors for the development of periodontal disease (Rivera-Hidalgo, 2003). Smoking also impairs healing after nonsurgical therapy (Preber, Linder, & Bergstrom, 1995). In the present study, smoking was found to have no statistical impact on the course of the disease in the patient group. However, the number of smokers in the group was small ($n = 15$), which was possibly the reason why the results were not statistically significant. However, it should be noted that nearly all heavy smokers in those patient groups with advanced forms of the disease (Fig. 15.1) also had negative correlations between the disease and so-called substitute gratification, as indicated by the subtest of drug use (Fig. 15.2).

Even excessive alcohol intake (Pitiphat et al., 2003) in association with a specific lifestyle (Sakki et al., 1995; Shizukuishi et al., 1998) is considered to exercise a harmful effect on periodontal disease. A passive stress coping strat-

egy that directly supports the risk factor is predominant in those seeking substitute gratification, especially smoking. In such cases, it is absolutely necessary to intervene. Therefore, the dental team, in particular the periodontal team, should confront the challenge of smoking prevention and cessation. The fact that some of the health professionals most commonly visited by patients are the dentists and oral hygienists offers a very important opportunity for counseling about tobacco cessation. The stress coping strategy, as a behavior variable, plays a very important role especially in cases of failure or relapse. In addition to general measures (Miller, 1990), the modification of patient behavior in regard to drug intake, as well as by more active than passive confrontation coping behavior, could simultaneously influence these risk factors of smoking, alcohol, drug abuse, and possibly diabetes and related obesity (Suls & Fletcher, 1985).

The results of this study show that passive coping strategies were more pronounced in advanced disease as well as in cases of poor response to a nonsurgical periodontal treatment. In contrast, patients with active coping modes had milder disease and a more favorable course of treatment. Thus, maladaptive behavior, especially in association with behavior-related risk factors such as smoking, as determined by the medical history, are of great importance in the medical history, treatment, and maintenance of patients with periodontal disease.

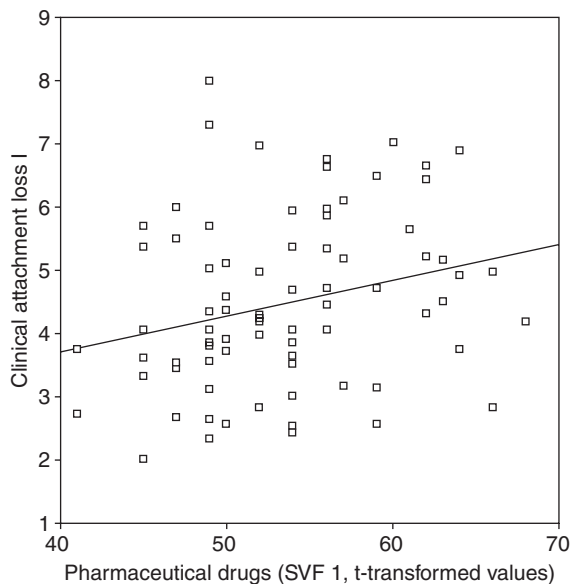


Fig. 15.2. An increase in t -values for the subtest drug use (pharmaceutical drugs) reveals a significant increase of CAL. The greater the abuse, the poorer were the clinical values.

Conclusion

Although it is impossible to conclusively state whether stress is a cause, one of the causes, a risk factor, or even a consequence of disease, it has already been established that stress weakens the immune system and facilitates the emergence of disease (Kiecolt-Glaser, 1999). In order to answer this question definitely, studies such as those reported here will be necessary as well as future studies of comparable quality, such as

large longitudinal studies and randomized interventional studies, and also animal experiment studies which directly investigate the influence of stress on periodontitis. Furthermore, as noted earlier, the available knowledge on this subject indicates that stress, psychological and psychosocial pressures, and inadequate coping are significant risk indicators for periodontal disease.

As noted by many authors, both intrapsychic (depression, anxiety) and psychosocial factors, such as the impact of life events, and professional and family situations, relative to the individual's stress coping strategies, should be noted and evaluated in the patient's history as they usually influence the individual's risk behavior in respect to dental and oral health, in association with oral hygiene and smoking, and may thus be one of several determinants of periodontitis. Although such inquiries into personal coping strategies will often be difficult for the treating dentist, this information must be assessed because, as demonstrated in the studies reported here, coping strategies usually influence the individual's risk behavior for periodontitis. Economical screening instruments focusing on the above-mentioned factors for the deleterious behavior in the patient would be desirable for the treating dentists—they could use them as preliminary instruments while counseling the patient. Thus, they would be able to identify patient groups at risk from the very start and would be able to achieve optimal patient compliance.

Subsequently, it would also be desirable to refer stressed patients to appropriate specialists for psychological-psychiatric support, stress management, or addiction counseling. This would be an additional step toward minimizing risk factors for periodontal disease. Furthermore, this would be an important and integrative part of a comprehensive periodontal treatment strategy in cases of advanced disease and would possibly influence the putative risk factor of stress in various forms of periodontal disease.

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16

Self-Efficacy Perceptions in Oral Health Behavior

Anna-Maija Syrjälä

Key points

- Dental self-efficacy—a person's conception about his/her ability to perform oral self-care—is important in changing oral health behavior.
- Sources of dental self-efficacy are the model received from home and school, a dentist's support, one's own experience in managing oral self-care, and emotional experiences in dental care.
- In order to improve patients' dental self-efficacy, the dentist provides information concerning oral health, offers positive feedback to patients, gives support to patients, provides models of oral health behavior, and creates a secure, peaceful atmosphere.
- It is important to improve parents' dental self-efficacy, which in turn is related to the oral health behavior of their children.
- Motivational interviewing is a useful method for improving self-efficacy and changing health behavior.

Theory of Self-Efficacy

Definition of the Concept

Bandura (1977) has advanced a theory of self-efficacy according to which personal self-efficacy is an important factor in behavior. According to the theory, an efficacy expectation is a conviction that a person can successfully fulfill the behavior which is needed to cause definite outcomes. Expectation of self-efficacy determines the beginning of coping behavior, the amount of effort used, and sustainment of the behavior when obstacles appear. In addition to expectation, component capabilities are also needed in order to produce the desired behavior. These include suitable skills and proper incentives (Bandura, 1977). People are afraid of and avoid situations they feel they cannot manage, whereas they act when they consider themselves able to cope (Bandura, 1977).

Bandura (1977) also defines the term outcome expectancy, which is an individual estimate that a certain action will lead to definite outcomes. Efficacy and outcome expectations are different in relation to their effect on behavior, because one may believe that a certain action will lead to a definite outcome, but if the person does not feel capable of performing the action, outcome expectancy does not have an effect on his/her action (Bandura, 1977).

Dimensions of Self-Efficacy

Efficacy expectations have various dimensions such as magnitude, generality, and strength, which vary. Magnitude includes the idea that the efficacy expectations of some people may be restricted to easy tasks or include very demanding ones. Generality on the other hand means that experiences vary from creating restricted self-efficacy to a more generalized expectation of mastery. Strength varies also, meaning that weak self-efficacy expectations may be canceled by undermining experiences, but people with strong expectations will cope despite such experiences (Bandura, 1977).

Sources of Self-Efficacy

According to Bandura (1977), the sources of self-efficacy are performance attainment, vicarious experience, verbal persuasion, and emotional arousal. Performance attainment is the most powerful source because it can consist of authentic experiences of mastery (Bandura, 1982).

People do not trust in their own experiences as the only source of expectations. Vicarious experiences such as the model of other people also have an effect on self-efficacy expectations (Bandura, 1982). Observing other similar people's success in performing can increase efficacy expectations among the observers.

In verbal persuasion, people are made to believe that they have capabilities which allow them to attain their objective (Bandura, 1982). Social persuasion may have limited power to induce durable growth in self-efficacy, but it can help in achieving success in performance if the persuasive evaluation is realistic.

People trust partly in their physiological state when they evaluate their capabilities. When tasks demand perseverance and strength, people evaluate their pains, aches, and fatigue as signs of physical inefficacy. Failure is more likely expected when people are viscerally agitated and tense, whereas success comes when they are not hindered by aversive arousal (Bandura, 1982).

Self-Efficacy in Health and Health Behavior

A person's belief in his/her ability to cope with stressors has an effect on biological systems that mediate disease and health (Bandura, 1992). If a person is exposed to stressors but has not perceived efficacy to manage them, this activates endogenous opiates and autonomic and catecholamine systems (Bandura, 1992). After coping efficacy is enhanced, the person manages these stressors without any distress or activation of stress hormones (Bandura, 2000).

Bandura's Social Cognitive Theory (SCT) includes self-efficacy as a determinant of health behavior, having an effect on control of health habits and progress of biological aging (Bandura, 2000). A person's self-efficacy beliefs about his/her own behavior and motivation affect a change in behavior: thinking of changing his/her health habits, enrolling perseverance and motivation, maintaining an achieved habit, and being sensitive to relapse (Bandura, 2000).

Self-efficacy has been found to relate to various health-related practices such as a change in dietary behavior (Cerin, Barnett, & Baranowski, 2009), smoking cessation (Spek et al., 2012), physical activity in diabetes (Qiu et al., 2012), and promoting intake of vegetables and fruits (Thomson & Ravia, 2011). Self-efficacy has also been found to be an important mediator in the relation between exercise and disability among elderly people (Motl & McAuley, 2010), and it is used in educational interventions in heart failure (Yehle & Plake, 2010).

Dental Self-Efficacy in Determining Oral Health Behavior and Oral Health Status

McCaul, Glasgow, and Gustafson (1985) found among 131 college students that self-efficacy and outcome expectations predicted retrospectively reported brushing and flossing and also self-monitoring of these behaviors, whereas Wolfe, Stewart, and Hartz (1991) did not find self-efficacy items among 99 male veterans to relate to plaque index.

Stewart, Strack, and Graves (1997) found among 103 employees that self-efficacy in brushing and flossing scales were significantly correlated with dental knowledge and frequency of brushing, flossing, and dental visits. Outcome expectations of dental disease were significantly correlated with flossing and willingness to spend money in order to save teeth. Outcome expectations of brushing and personal beliefs were correlated with dental visits and willingness to spend to save teeth. The writers

interpret their results to suggest that outcome expectations and self-efficacy expectations are a separate domain in oral hygiene beliefs.

Syrjälä, Knecht, and Knuuttila (1999) found among 149 insulin-dependent diabetes mellitus (IDDM) patients that toothbrushing self-efficacy was related to reported frequency of toothbrushing, approximal cleaning self-efficacy to reported frequency of approximal cleaning, and dental visiting self-efficacy to reported frequency of dental visiting. Dental plaque was inversely correlated with toothbrushing and dental visiting self-efficacy. Women had significantly higher sum scores than men in brushing and dental visiting self-efficacy. Knecht et al. (1999) reported similarly that a combination of brushing and dental visiting self-efficacy as dental self-efficacy was associated with the sum of decayed surfaces. Dental self-efficacy and diabetes self-efficacy were correlated. Furthermore, Syrjälä et al. (2004) reported on a similar comparative analysis in which psychological characteristics such as self-efficacy, intention, locus of control, or self-esteem most comprehensively explained oral health habits, deepened periodontal pockets, dental caries, diabetes adherence, and HbA1c. Both dental and diabetes self-efficacy were found to be related to diabetes adherence and oral health habits. Only self-efficacy was associated with both oral health habits and diabetes adherence.

Kakudate et al. (2007) and Kakudate, Morita, and Kawanami (2008) have developed self-efficacy scales (SESS) for periodontal patients, including subscales such as SE-DC, self-efficacy in dental consultation; SE-B, self-efficacy in toothbrushing; and SE-DH, self-efficacy in eating habits. In a pilot study, Kakudate et al. (2008) found that patients with successful completion of periodontal therapy had higher SESS and subscale SE-DC scores when compared with patients who failed to follow the periodontal therapy. Later they confirmed these results when they found that those who had middle SESS scores (OR: 1.05, CI: 0.36–3.07) or low SESS scores (OR 4.56, CI: 1.11–18.74) at the baseline were more likely to lose

periodontal maintenance care when compared to those with high scores (Kakudate et al., 2010b).

Self-Efficacy and Other Health Behavior Theories

Tedesco, Keffer, and Fleck-Kandath (1991) found that adding self-efficacy variables into Fisbein and Ajzen's theory of reasoned action increased the variance of reports of brushing and flossing teeth, and Jönsson et al. (2012) found that when self-efficacy variables were added to the theory of reasoned action, self-efficacy was the way through which normative beliefs had an impact on interproximal cleaning. However, McCaul, O'Neill, and Glasgow (1988) did not find the addition of self-efficacy variables to the theoretical model of reasoned action to enhance prediction of oral health habits.

Buglar, White, and Robinson (2010) found among 92 dental patients that the Health Belief Model's variable obstacles to brushing and flossing and self-efficacy in brushing and flossing significantly predicted corresponding behavior. The authors concluded that dental professionals ought to urge patients' self-confidence in brushing and flossing and discuss with patients how they could cope with obstacles to performing oral hygiene. Furthermore, Anagnostopoulos et al. (2011) analyzed Health Belief Model variables and toothbrushing self-efficacy beliefs in dental caries and the frequency of toothbrushing among 125 dental patients. The Health Belief Model variable "severity of oral diseases" as well as higher self-efficacy beliefs were related to a higher frequency of toothbrushing, which was related to better oral status.

Morowatisharifabad et al. (2011) tested the Transtheoretical Model to get an understanding of change in interdental cleaning behavior among 361 12th grade students in Iran. The stages of interdental cleaning and psychological attributes such as self-efficacy and decisional balance were identified. The results showed that about half of the students were in the precontemplation stage and 13% were in the maintenance phase, correspondingly. Deci-

sional balance and self-efficacy differed in terms of behavioral change in interdental cleaning. The authors conclude that the Transtheoretical Model was useful when defining the stages in behavioral change. Empirically supported interventions should be developed in order to enhance interdental cleaning behavior, emphasizing improvement in the self-efficacy of the students in this context.

Lee et al. (2012) analyzed the relation between oral health literacy (OHL) and oral health status and dental neglect, and the role of self-efficacy in mediating or modifying these relations. The study population included 1280 females in the Special Supplemental Nutrition Program for Women, Infants, and Children. A word recognition test was used to measure OHL, and data on oral health status were received with a self-reported item on the National Health and Nutrition Examination Survey (NHANES). It was found that higher OHL was related to better oral status, and self-efficacy was strongly negatively correlated with dental neglect. The authors conclude that increased OHL was related to better oral health status but not to dental neglect. Self-efficacy was strongly correlated with dental neglect and may disseminate the role of literacy in dental status.

Self-efficacy is a determinant of health behavior also in the Theory of Planned Behavior and the Protection Motivation Theory (Bandura, 2000). Furthermore, self-efficacy in health behavior has been found to correlate with locus-of-control beliefs, self-esteem, and intention in health behavior (Syrjälä et al., 2004).

Sources of Dental Self-Efficacy in Oral Health Behavior

According to Bandura (1981), the formation of perceived self-efficacy begins in infancy and grows as a result of interaction with the family and widens in interaction with peers. Self-efficacy is affected by transitional experiences in adolescence, and it is moderated in adulthood by opposing demands and reappraised with advancing age. Thus, formation of self-efficacy

continues during the lifetime of a person. Many habits that imperil health are formed in childhood and adolescence (Bandura, 2000).

In order to improve perception of dental self-efficacy in patient-centered interaction, it is important to understand the formation and role of dental self-efficacy. Syrjälä, Knuuttila, and Syrjälä (2001) describe five sources of dental self-efficacy in a qualitative study. They selected five participants for a focused interview on the basis of scores in a quantitative questionnaire about oral health orientation. On the basis of the interview, it was found that one basic source of dental self-efficacy was knowledge about oral health behavior. Two persons with poor dental self-efficacy proposed that a lack of knowledge affected their self-efficacy. The second source of self-efficacy was experience in caring for one's own oral health. The participants' own experience of taking care of their teeth either sufficiently or insufficiently, with consequences of good or poor oral health, seemed to be related to better or poorer self-efficacy, respectively. The third dimension was support received from the dentist. People who had gotten support from their dentist had better dental self-efficacy, whereas lacking supportive experience was related to poorer dental self-efficacy. Negative emotional arousal, such as a difficult extraction, was a source of poor dental self-efficacy but, on the other hand, two persons had overcome their previous negative experiences in dental care and now wanted to take care of their teeth, thus resulting in better self-efficacy. The fifth source was the model received in childhood, like from home or school, and the person who had had a model of taking care of teeth regularly in childhood now had better self-efficacy.

The Role of the Family in the Self-Efficacy of Children

Cinar, Tseveenjav, and Murtomaa (2009) have analyzed self-efficacy and toothbrushing among preadolescents and their mothers using the SCT. The study population included Turkish ($n = 611$) and Finnish ($n = 338$) preadolescents

and their mothers. They found that Turkish preadolescents and mothers had lower toothbrushing frequency and lower self-efficacy when compared with Finnish children and mothers. Finnish children with high self-efficacy more likely also had mothers with high self-efficacy. Maternal self-efficacy accounted for Finnish preadolescents' toothbrushing behavior (Cinar et al., 2009).

Finlayson et al. (2007a) have analyzed the association between several maternal behavioral, cognitive, and psychosocial factors and brushing habits among preschool children of 1021 African-American families. They used in the analysis previously developed scales for mothers, such as maternal oral-health-related self-efficacy, OHSE; knowledge about appropriate use of bottle, KBU; knowledge of children's oral hygiene, KCOH; and belief in oral health fatalism, OHF (Finlayson et al., 2005). Maternal oral-health-related self-efficacy, OHSE, was found to predict 1- to 3- and 4- to 5-year-old children's brushing frequency, and mothers' better knowledge of children's oral hygiene, KCOH, was related to 1- to 3- and 4- to 5-year-old children's brushing frequency (Finlayson et al., 2007a). In another report (Finlayson et al., 2007b), maternal self-efficacy was not, however, associated with early childhood caries among 1- to 5-year-old children.

Kakudate et al. (2010a) have developed "a task-specific self-efficacy scale for maternal oral care" (SESMO), including self-efficacy subscales for brushing (SESMO-B), dietary habits (SESMO-DH), and dentist consultation (SESMO-DC). Negative correlations were found between the number of teeth with decay and SESMO and SESMO-DC scores and positive correlations between frequency of weekly toothbrushing of children's teeth and SESMO and SESMO-B scores.

Interventions in Self-Efficacy to Improve Oral Health Behavior

Höglund (1990) reports an intervention in which 14-year-old students learned about health

matters by teaching younger students. Knowledge about dental caries and sugar, nutrition and sugar, self-efficacy, and beliefs concerning susceptibility were evaluated before and after intervention. Fourteen-year-old students worked first in groups having various topics. In a computer group, dietary habits were analyzed among fourth graders. A culture group analyzed local and national factors affecting dietary habits. A food and fashion group dealt with commercials and body image. A health group compared caries prevalence between fourth and eighth graders. The eighth graders had to present their results on posters to the fourth graders. It was found that the intervention had no effect on posttest self-efficacy, but in a 2-month follow-up, self-efficacy was improved a little.

Stewart et al. (1996) reported an intervention among 123 veterans. Before the intervention, the subjects' self-efficacy concerning brushing and flossing was evaluated. The participants also completed a Dental Health Knowledge Questionnaire before the study and 5 weeks thereafter. All the participants were given a demonstration of toothbrushing and dental flossing. An educational intervention included four information sessions about periodontal disease and correction of oral hygiene techniques. A psychological intervention included also four sessions based on the model presented by Prochaska and DiClemente (1983). It was found that total flossing self-efficacy increased significantly in the educational and psychological intervention groups and in a control group. The psychological intervention group had significantly higher changes in flossing self-efficacy when compared with the other groups.

Wolfe et al. (1996) used the Dental Coping Belief Scale (DCBS) to evaluate cognitive changes in a dental intervention. In an educational intervention group, the subjects received two presentations on plaque control and oral hygiene instruction given by a dentist. In a cognitive behavioral intervention, the subjects were provided the same instruction as in the educational intervention and in addition, they

received one session provided by a psychologist where the subjects were helped to develop plans to carry out maintenance of good oral hygiene behavior. An attention intention group received a cognitive intervention followed by an educational intervention. After the intervention, the DCBS self-efficacy score increased in all the intervention groups.

Schüz et al. (2006) applied the SCT to daily flossing among 157 university students. As SCT variables, they analyzed cognition about risk for dental diseases with nonuse of dental floss, outcome expectations about regular flossing to decrease the risk for periodontal disease, and self-efficacy to clean interdental spaces. Furthermore, they had items about intention to floss and plans for flossing. The students were first met during lectures at the university and they filled in a questionnaire about SCT variables and flossing frequency, received dental floss, and were instructed how to floss. Later, postal questionnaires were sent out 2 and 6 weeks after the university meeting. It was found that all the social cognitive variables, such as risk perception, outcome expectations, and flossing self-efficacy, correlated with intentions to floss regularly. Furthermore, outcome expectations and flossing self-efficacy correlated with flossing frequency at the university meeting and after 6 weeks. Risk perception correlated with flossing frequency at the university meeting. Multivariate models showed that only flossing at the university meeting and planning 2 weeks after that predicted adherence to recommendations for flossing. The authors concluded that planning ought to be targeted in dental interventions in order to improve compliance with recommendations for flossing.

Clarkson et al. (2009) reported on a patient-randomized controlled trial (RCT) (37 dentists and 300 patients) and cluster-randomized controlled trials (50 dentists and 478 patients) where the SCT (Bandura, 1999) and the Implementation Intention Theory (Gollwitzer, 1999) were used to improve oral hygiene behavior. In the intervention, for example, timing, duration, and method of toothbrushing, cognitive mea-

tures, oral hygiene self-efficacy, planning of toothbrushing, and dental plaque were analyzed. In the intervention, the SCT included telling the patient what is needed, such as brushing twice a day, brushing for 2 minutes, using an electric toothbrush, using fluoride toothpaste, spitting, cleaning his/her teeth to feel smooth; showing the patient the technique of toothbrushing on a model; doing, that is, having the patient clean his/her teeth with a power toothbrush and the dentist checking and correcting the technique. After that, as a part of the Implementation Intention Theory, the dentist gives the toothbrush to the patient to take home and elicits a plan for the patient on the best time to use the toothbrush. It was found that patients who received the intervention had better self-efficacy and planning, and they reported better method, timing, and duration of toothbrushing. However, clinical outcomes improved only in the intervention group of the cluster-randomized controlled trials, among whom a significant decrease in the mean percentage of plaque surfaces was found. The clinical outcomes did not improve in the patient RCT. The authors conclude that a theory-based, simple intervention performed within the limits of primary care settings was more effective in patients' behavior, cognitions, and health when compared with routine care.

Kakudate et al. (2009) have presented a six-step cognitive behavioral approach to improving periodontal patients' self-care. They analyzed if a six-step method would be more effective than traditional instruction in oral hygiene. The study population included 38 periodontitis patients (18 in an intervention group, 20 in a control group). Both the control group and the intervention group received 20 minutes of traditional instruction about oral hygiene a week for three weeks. In addition, the intervention group took part in the six-step method:

The first step includes identifying the problem, during which information about knowledge, obstacles, and beliefs related to oral self-care is gathered in an interview. The crucial

questions are (1) the content of the patient's oral self-care, that is, how many times and how long the patient brushes his/her teeth and how many times a week the patient performs interdental cleaning and when does the patient brush; (2) what does the patient know about oral self-care; (3) has the patient tried to change his/her behavior previously; (4) and what inhibits his/her change. The problem is told to the patient and also that the behavior is deleterious to the patient's health and that a modification in behavior is needed.

The second step includes creating commitment and confidence so the patient can change his/her behavior. The obstacles to change are assessed, and responses and counterarguments to these obstacles are presented. A story of a model person is told in order to aid the patient to become conscious of her/his presumption. After that, to strengthen the intention and enhance motivation, the patient and the dentist sign a contract to begin to work toward a specific behavioral change.

The third step includes increasing awareness of the patient's behavior. Self-monitoring of daily brushing and interdental cleaning is used to improve the patient's consciousness of her/his behavior. The patient keeps a diary about daily oral self-care and also to profile her/his feelings at the time of toothbrushing. The diary helps in finding external and internal antecedents to the behavior which may act as hints to the behavior. Also, possible obstacles to the behavioral change may be identified by the diary.

The fourth step includes developing and implementation the action plan. On the basis of the patient's behavior, oral hygiene reported in the diary, and the status of oral hygiene, a short-term plan for action with gradual degrees, is developed. The action plan is realistic, concrete, and achievable, such as brushing teeth twice a day and using dental floss once a day. Incentives for the health behavior are also selected. The patient sets the goal and the incentives, and the dentist supports him/her. In behavior change, Miller and Rollnick (2002) note that

preferably, the patient rather than the counselor evaluates behavior and presents explanations for change. Here the behavioral change is determined by the intentions of the patient.

The fifth step includes evaluation of the plan: Has the patient achieved the action plan? Success in achieving the plan is praised and support is given. Failure is considered to include a failure in the plan, and a new achievable plan is made.

The sixth step includes maintaining the change and preventing a relapse. There are high-risk situations, such as traveling and long working hours, which may cause a relapse in maintaining the acquired behavior. It is remarkable for the dental personnel to assist and encourage the patient to ensure the new behavior.

The first five steps were carried out during three appointments, and the subjects received oral hygiene instructions during these appointments. At the final examination, the intervention group had higher toothbrushing self-efficacy and less dental plaque, and they brushed their teeth for a longer time and cleaned their interdental spaces more frequently than the control group.

The authors conclude that the six-step method may be more effective in improving self-efficacy and changing oral health behavior when compared with traditional instruction.

Strippel (2010) reported on a structured comprehensive pediatric oral health education (SC-OHE) intervention aimed at parents with children younger than 2 years. Thirty-six clinicians in specialist pediatric practices provided oral health education along with written material to the parents when the children came to their health examination appointment. Two intervention groups (total $n = 2170$), children with a mean age of 7 months and 24 months, received the SC-OHE intervention, and two control groups (total $n = 2040$) received conventional oral health education. Outcome variables such as parental knowledge, behavior, and attitudes related to reducing the risk of early childhood caries were measured by questionnaires, which were sent to the parents. After the inter-

vention, it was found that parental attitudes and self-efficacy had not changed, although the parents in the intervention group reported that the proportion of 7-month-old children using baby bottles including cariogenic contents and addition of sugar to baby food were smaller than in the control group. Only part of the nutritional behavior of 24-month-olds changed, and toothbrushing and use of fluoride remained unchanged. The authors conclude that SC-OHE intervention carried out by clinicians alone is not able to have an effect on oral health behavior that prevents early childhood caries.

Gilinsky et al. (2012) reported on the effect of theory-based intervention on knowledge, attitude, and oral health behavior among 8 staff members, 79 parents, and 111 children (3–5 years old) in a nursery. The target of the staff sessions was outcome expectations, self-efficacy, and subjective norms concerning toothbrushing in the nursery. The intervention included information, goal-setting, and modeling followed by an intervention lasting 3 weeks. The parents of the children received a leaflet which included instructions for planning, goal-setting, and monitoring toothbrushing at home. Self-monitoring material was also used, and as rewards, certificates were provided in the nursery. As outcome measures, the attitudes, knowledge, and behavior of the nursery staff were evaluated by means of self-reported questionnaires before the intervention and after it. The parents were interviewed concerning their beliefs about their own and their children's toothbrushing at the baseline and after the intervention. It was found that only staff knowledge was significantly improved, but self-efficacy, attitudes, or toothbrushing in the nursery were not improved. The parents were not more likely to have their children brush their teeth twice a day at home, and their intention to brush the child's teeth two times a day was not improved. The authors conclude that posttest toothbrushing was predicted only by past behavior. The parents who thought brushing was easier at the baseline more likely fulfilled the intervention. The authors propose

recommendations for implementing psychological theory in dental health interventions.

Motivational Interviewing to Improve Self-Efficacy

Motivational interviewing is a client-centered counseling method for “enhancing intrinsic motivation to change by exploring and resolving ambivalence” (Miller & Rollnick, 2002). Motivational interviewing has been shown to be an effective way to change a client’s health behavior, such as improving weight loss (Armstrong et al., 2011), improving health behavior among persons with risk factors of coronary heart disease (Thompson et al., 2011), and smoking cessation (Heckman, Egleston, & Hofmann, 2010). In dental settings, motivational interviewing for families has been shown to decrease caries among children (Hirsch et al., 2012), and motivational interviewing has been found to be useful in improving caregivers’ and parents’ preventive oral health behavior (Harrison et al., 2007; Freudenthal & Bowen, 2010; Ismail et al., 2011) and in improving periodontal health along with scaling (Jönsson et al., 2010).

According to Miller and Rollnick (2002), motivational interviewing includes four principles: (1) expressing empathy, (2) developing discrepancy, (3) rolling with resistance, and (4) supporting self-efficacy. Miller and Rollnick (2002) consider self-efficacy as a key factor in motivation to change and as a good predictor of outcome. Motivational interviewing has been found to increase self-efficacy in management of diabetes (Chen et al., 2012) and in exercise (Hardcastle, Blake, & Hagger, 2012).

Implementation of Motivational Interviewing in Dentistry

Expressing Empathy

Reflective listening and empathetic communication are maintained throughout the interview (Miller & Rollnick, 2002). Empathy includes

acceptance as an underlying attitude, and with the aid of reflective listening, the interviewer tries to understand the perspectives and feelings of the client without criticizing, blaming, or judging (Miller & Rollnick, 2002). Reflecting on the patient conveys interest, understanding, and acceptance (Bundy, 2004). Ambivalence is not found as a pathological trait, but as a normal part of change and experience (Miller & Rollnick, 2002).

The dentist may show interest by saying, for example,

It is very good that you now came to the dentist. I want to help you with your oral problem. I want to know what you are worried about regarding your oral health.

The dentist reflects on the comments of the patient and shows interest, understanding, and acceptance by saying, for example,

You said that caring teeth daily is boring and I understand you that it is a monotonous routine to brush the teeth and clean the interdental spaces every day. You said that dental floss breaks between the teeth and I understand you that you feel frustrated and stop the flossing when the dental floss breaks between your teeth. You said that you are ashamed of your bad-looking teeth and I understand your feeling to communicate with other people with bad teeth. You said that you are worried about your loose teeth and I understand your fear to lose them all. You said that you are worried about your bad breath and I understand your feeling to communicate with other people.

When the patient receives acceptance, he/she may try to behave in an alternative way, and although every situation may not be acceptable, all people are (Bundy, 2004).

Developing Discrepancy

The discrepancy between current behavior and important aims motivates the change (Miller &

Rollnick, 2002). The interviewer creates and amplifies the discrepancy in the person, and it is the client, not just the counselor, who presents reasons for change (Miller & Rollnick, 2002).

The dentist strengthens the discrepancy between current and optimal oral health.

A noticed discrepancy between current poor oral health behavior and important values and aims, such as good oral health, a beautiful smile, fresh breath, and lack of a toothache, acts as a motivator for the patient. The approach allows the patient himself/herself to give arguments for a change in oral health behavior.

The dentist may strengthen the discrepancy by saying, for example,

Now your gums are inflamed, bleeding, and sore, but by cooperating, such as removing dental plaque and calculus during a dental appointment and good oral home care, we'll get them healthy. Now your carious teeth seem bad and you are ashamed to smile with them, but with modern dental restorations and good oral home care we'll get them looking fine and you can smile freely with self-confidence.

The patient may give arguments for the change by saying, for example, "My oral health is even poorer than I thought." "I'd like to keep my own teeth; what should I do now?" "I have known that a person should floss his/her teeth every day and until now I have not cared, but now I understand that it is important."

Rolling with Resistance

When rolling with resistance, the counselor seeks to avoid arguing and offers new aspects without pressing (Miller & Rollnick, 2002). When rolling with resistance, the counselor poses questions and asks for clarification, and these may help the patient see the discrepancy between the beliefs that maintain controversy between the present situation and to where they desire to move (Bundy, 2004). The client himself/herself is an important source for

finding solutions to the problems (Miller & Rollnick, 2002).

The dentist avoids arguing. It is not useful for the dentist to say: "You have a big dental problem, and you have to change your oral health habits thoroughly," because this may evoke defensiveness on the part of the patient.

Neither is it useful for the dentist to label the patient, even in the mind, that the patient is hopeless and will never be motivated to perform proper oral home care.

The dentist rolls with resistance by saying,

You said you never want to floss and I understand your opinion, because you have very tight contacts in your fillings, and it is really difficult to floss your teeth. I have to first fix the contacts of your fillings to help your flossing.

The patient says: "I dislike dental visits because I have previously had very complicated, long-lasting, and painful endodontic treatment and that's why I have not visited a dentist for many years." The dentist says: "I agree with you, I saw in your patient records that you have had exceptionally complicated dental treatment. I want to help you overcome those experiences; would you like to tell me more about them?"

Supporting Self-Efficacy

The person's own belief in the prospect of change motivates the change and the client is responsible for carrying out the change (Miller & Rollnick, 2002). The counselor's belief that the client is able to change his/her behavior creates a self-fulfilling prediction (Miller & Rollnick, 2002).

The dentist supports the self-efficacy of the patient. The dentist notes the responsibility of the patient by saying, for example, "I hope you understand that that it is your own decision to improve your oral health behavior."

The dentist provides support by believing in the ability of the patient to perform oral

hygiene procedures by saying, for example, "Although you now have some carious teeth and periodontal problems, I believe you will learn to use an electric toothbrush and dental floss and you will benefit from oral home care to prevent dental problems." "Even now you have been able to brush most of your dentition well and I am sure you can also brush your back teeth when you concentrate on brushing them." "I am sure you can change your oral health behavior." "I am sure you can find time to floss your teeth every evening." "I am sure that you and me together can get your teeth looking fine."

Conclusions

According to previous studies, dental self-efficacy seems to determine oral health habits well. Dental self-efficacy has also been found to determine diabetes health behavior. Improvement of self-efficacy in one area of health behavior may have an effect on other aspects of health behavior. Parents' self-efficacy is related to the oral health behavior of their children.

Thus, in order to improve oral health behavior in clinical practice, it is important to enhance dental self-efficacy in patient-centered interaction. Sources of dental self-efficacy have been analyzed in one case study. In that report, it was found that one basic source of dental self-efficacy was knowledge about oral health behavior. The second source of self-efficacy was experience in caring for one's own oral health. The third dimension was support received from the dentist. The fourth source of dental self-efficacy was emotional arousal related to previous experiences of dislike. The fifth source was the model received in childhood, like from home or from school.

Thus, the dentist can improve and shape the perception of dental self-efficacy in the following ways:

1. The dentist can give information concerning oral health.
2. The dentist can encourage the patient and provide positive feedback to the patient in order to improve the patient's own successful experiences in oral home care.
3. The dentist can give support to patients.
4. The dentist can provide models of oral health behavior.
5. The dentist can create a secure, peaceful atmosphere in order to reduce dental fear and emotional arousal related to dental visits.
6. The dentist can use an empowering approach, such as motivational interviewing, to help patients find their competence to solve their dental problems, thereby reinforcing their self-efficacy and individual responsibility. The dentist can help the patient develop plans to carry out maintenance of good oral hygiene behavior and prevent a relapse in routine oral hygiene. It is important to create an atmosphere where the patient can freely make a decision whether or not to commit to the oral health behavior.
7. Parents can be given knowledge and support in relation to their children's oral health care in order to improve the parents' self-efficacy, which in turn is related to the oral health behavior of their children.

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17

Drooling and Tongue Protrusion

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Key points

- Given the negative implications for health, social interaction, and participation, behavioral procedures have been developed to reduce drooling and tongue protrusion.
- For drooling, five types of behavioral procedures have been shown to be effective: (a) instruction, prompting, and positive social reinforcement; (b) negative social reinforcement and other decelerative procedures; (c) cueing techniques; (d) microswitch-based techniques, and (e) self-management procedures.
- For tongue protrusion, there is some preliminary evidence for comparable behavioral procedures (except for microswitch-based techniques), although studies on behavioral treatment are very limited.
- The behavioral procedure of choice for drooling and tongue protrusion is dependent on personal factors (e.g., motor ability, learning ability, intrinsic motivation) and environmental factors (e.g., availability of staff, acceptability of devices). Guidelines are provided.
- For both drooling and tongue protrusion, behavioral procedures should be considered before other, more intrusive treatments like medication and surgery are implemented.

Introduction

Drooling and tongue protrusion are challenging behaviors commonly observed in persons with developmental disabilities. Given their negative implications for health, and social interaction and participation, behavioral procedures have been developed to reduce these behaviors. In this chapter, we will present a selective review of studies on behavioral procedures for drooling and tongue protrusion and discuss their applicability in persons with developmental disabilities.

Drooling: Definition, Prevalence, and Cause

Blasco and Allaire (1992, p. 849) define drooling as “the unintentional loss of saliva and other contents from the mouth.” Drooling severity varies from incidental occurrence of saliva below the lower lip line to strings of dribble continuously falling from the mouth or chin. Drooling is a normal phenomenon up to the age of 18 months, but it persists in children with poor neuromuscular coordination, intellectual disability (ID), and/or children with no structural integrity of jaws, lips, or oral cavity. Drooling is reported in 10–37.5% of patients with cerebral palsy (CP; Ekedahl & Hallen, 1973; Van de Heyning, Marquet, & Creten, 1980). This percentage appears to be even higher among CP children attending special schools: 58% of 4- to 18-year-old children were reported to drool, with 33% (53/160) of the total school population drooling severely (Tahmassebi & Curzon, 2003).

Drooling is not caused by hypersalivation, except for children with dyskenetic CP (Erasmus et al., 2009). In other children with CP, persistent drooling is primarily due to oral motor dysfunction: inefficient (particularly in the oral phase) and/or infrequent swallowing and/or poor lip closure (Sochaniwskyj et al., 1986; Harris & Purdy, 1987; Hussein et al., 1998). In addition, Burgmayer and Jung (1983) state that saliva running down the lower lip or chin causes an

aversive sensation in infants. In the normal development of swallowing, the young child learns to avoid this unpleasant sensation. If this aversive sensation does not occur in CP, swallowing as avoidance behavior does not develop spontaneously.

Drooling affects physical health and well-being negatively. Children suffer from chronically irritated, chapped, or macerated skin over the chin and peri-oral region leading to cheilitis in 67% of the cases (Wilson & Henderson, 1999). Sometimes there is a chronic loss of fluids and nutrients, and in case of posterior drooling (Jongerijs et al., 2005), children with inadequate swallowing frequently aspirate their own saliva, which may cause recurrent pneumonia. In addition, drooling has an adverse effect on social and emotional functioning (Van der Burg et al., 2006).

Drooling: Description of Treatment Procedures

Behavioral treatment for drooling aims at increasing target behaviors such as swallowing, wiping, head control, mouth closure, nondrooling, and self-control. In this section we distinguish five types of treatment procedures: (a) instruction, prompting, and positive social reinforcement; (b) negative social reinforcement and other decelerative procedures; (c) cueing techniques; (d) microswitch-based techniques, and (e) self-management procedures.

Instruction, Prompting, and Positive Social Reinforcement

Instruction and prompting are both antecedent techniques preceding the target behavior. For example, the child is instructed to wipe the face whenever the chin is wet or is prompted to swallow if the trainer spots saliva on the child's lip or before beginning to talk.

Positive social reinforcement is an example of a consequent technique. Following the performance of target behavior, a reinforcing stim-

ulus such as a positive remark is given, occasionally paired with a token or an edible. In several studies, positive reinforcement for nondrooling behavior was given. This behavioral technique is called differential reinforcement of other (nonchallenging) behavior (DRO).

Typically, combinations of behavioral techniques are used. For instance, Garber (1971) successfully reduced drooling during articulatory therapy in a 14-year-old boy by prompting him to swallow before speaking. In addition, he was verbally praised for swallowing and rewarded with pennies for being dry during increasing time intervals. In a related study, Barton and Madsen (1980) prompted an 11-year-old boy who had severe ID to wipe his face contingent on drooling and praised him for both wiping and nondrooling for which he also received drinks. DRO was also implemented by Richman and Kozlowski (1977). After positive reinforcement of head control and imitative vocalization in a 9-year-old girl with severe ID, they found an improvement in these target behaviors in addition to a reduction in drooling.

Negative Social Reinforcement and Other Decelerative Procedures

Negative social reinforcement and other decelerative procedures are also consequent procedures. Contingent upon the occurrence of drooling, a negative stimulus such as a verbal warning or a time-out is given (Poling et al., 1978; Connis & Rusch, 1980; Burgmayer & Jung, 1983). Connis and Rusch (1980) report a significant decrease in drooling in a 22-year-old adult with moderate ID as a result of a treatment package consisting of reprimands for drooling, instructions to keep his mouth closed, and praise for being dry, which were all faded (i.e., gradual reduction of implementation of these techniques). Burgmayer and Jung (1983) used a brief period of withdrawal of attention (time-out) by the therapist contingent on drooling.

In some studies, a more intrusive decelerative procedure is implemented contingent upon drooling (Drabman et al., 1979; Trott & Maecht-

len, 1986; Kay, Harchik, & Luiselli, 2006). Kay et al. (2006) trained a 17-year-old student with autism who attended a public high school. After preteaching sessions in which he was taught to respond to the instructions "Swallow" and "Wipe your mouth," regular checks (increasing from 5 to 15 minutes) were made by the aid in the classroom, community vocational site, and cooking class throughout the school day. If the student's face was dry, he was praised, and an edible treat was presented. If his face was wet, he was required to wipe his mouth and swallow three times successively; a procedure called "overcorrection." Drabman et al. (1979) described two studies in which the most intrusive overcorrection procedure was used: contingent upon drooling, a verbal reprimand was given and the child was prompted to wipe his or her chin 50 times.

Cueing Techniques

Several studies report on a specific prompting procedure by electronic cueing (Barton, Leigh, & Myrvang, 1977; Rapp & Bowers, 1979; Rapp, 1980; Jones, 1982; Burgmayer & Jung, 1983; Koheil et al., 1987; Lancioni et al., 1989; Lancioni, Brouwer, & Coninx, 1992, 1994). An electronic cueing device emits visual, auditory, or tactile cues (i.e., antecedent stimuli) to increase the frequency of swallowing or wiping the mouth and chin. Cueing frequency varies across studies from once every 15 seconds (Barton et al., 1977) to every 5 minutes (Burgmayer & Jung, 1983). In the first studies, the device was situated on a table, while in later studies, portable cueing devices were worn by participants.

In their extensive study of over 500 sessions per participant, Barton et al. (1977) trained two men (24 and 28 years; moderate and severe ID, respectively). Swallowing was verbally prompted and rewarded with tokens. The second participant also received a visual cue light every 15 seconds to pace swallowing. To elicit a wiping response, an auditory cue from a buzzer on the table was presented contingent

upon the occurrence of drooling. Both electronic cues were gradually faded out. Rapp and Bowers (1979) described a portable cueing device (a so-called dribble box) that electronically prompted seven children with CP (aged 15–16 years; developmental age 4–8 years) to swallow after a 2- to 3-second auditory cue at fixed time intervals. After the stimulus–response chain (i.e., swallowing contingent on the cue) was established during an undemanding task, the children wore the device attached to their clothes throughout the day. While Rapp (1980) used a small box pinned to the child’s clothes, Burgmayer and Jung (1983) used a watch, which produced an auditory cue of about 30 dB at 5-minute intervals to elicit regular swallowing in an 8-year-old male with CP and severe ID.

Lancioni et al. (1992) evaluated different cueing procedures with “brief” versus “flexible” auditory cues in two participants who had moderate to severe ID (aged 27 and 20 years). Brief cues with a fixed duration (2.5 seconds) were given at fixed intervals (2 minutes). Flexible cues lasted until the target response occurred, after which a new interval started. Lancioni et al. (1992) concluded that flexible cues are particularly effective in producing a consistent response, while brief cues may be sufficient to ensure a response from some individuals, but not from all.

Cueing techniques for drooling have also been adapted for people who are deaf. Lancioni et al. (1989) trained two participants who were deaf (aged 11 and 16 years; the first had mild ID next to motor disabilities, the second had a learning disability without motor disabilities) through the use of tactile and visual cues, which lasted until the wiping response was performed. If the response was performed spontaneously, the cue was avoided. The portable cueing device consisted of an electronic circuitry which included a timer (placed at the participant’s belt), a vibrator (at the waist or connected with the ear mold of the hearing aid) or a light (at the inside of the frame of the participants’ eyeglasses), and a response sensor (a wireless transmitter on the wrist which, whenever in

close proximity, activated a tiny receiver at the shoulder). The wiping response was registered and resulted in the interruption of cueing and/or resetting of the timer to a new interval.

Microswitch-Based Techniques

Seven studies were carried out with the use of microswitch-based technologies for persons with severe/profound ID and multiple disabilities (Lancioni et al., 2008a,b, 2009a,b,c, 2011a,b). These studies were aimed at evaluating technological solutions that allowed both direct monitoring of specific participants’ responses appropriate to reduce the effects of drooling, and automatic delivery of positive stimulation (i.e., consequent stimuli) contingent on those responses. One form of technology used in those studies consisted of a pressure microswitch, an amplified MP3 for musical stimulation, and an electronic control system, all embedded in the napkin that the participant wore.

For example, Lancioni et al. (2009b) carried out a study with two participants. The technology used for the first participant (a boy of 12 years of age) relied on a napkin containing a pressure microswitch and a radio transmitter. Whenever the boy pressed the napkin against his chin/mouth to wipe out the saliva, the pressure microswitch was activated. This activation triggered the radio transmitter, which in turn put on an electronic control system and a screen with visual stimuli accompanied by various auditory inputs. The stimuli remained on for a period of 8 seconds. The sessions lasted 5 minutes. Data showed that the boy increased the frequencies of mouth-wiping responses from very low levels to about 16 and 20 during the two intervention phases, respectively. This response increase coincided with declines in the percentages of observation intervals with chin wetness. The second participant (a man of 32 years of age) relied on the use of an optic microswitch and a handkerchief. Wiping his mouth through the handkerchief activated the optic microswitch, which was fixed to his shirt at the

basis of his neck. This activation triggered a radio transmitter and an electronic control system, which ensured 8–10 seconds of vibrotactile stimulation. This was produced by one of two devices fixed at the waist and on the legs of the man, respectively. Once the man had consolidated his responding, the stimulation conditions were changed to regulate (reduce) the frequency of his wiping response. The changes consisted of adding a growing appendix of low-impact stimuli (i.e., stimuli of reduced intensity and possibly reduced effect) to the 8–10 seconds of preferred vibration. The length of the appendix finally reached 16 seconds. Such an extension was considered a functional strategy to widen the inter-response interval, as the man was not expected to respond during the presence of stimulation. Reducing the overall response frequency was thought sufficient to control the effects of drooling, improve the man's social appearance, and reduce risks of skin irritation. The session lasted 5 minutes, but two or three sessions could be carried out in succession. Data showed that the man had about 20 responses per session prior to the extension of the stimulation period and about 10 responses per session after the extension of the stimulation was completed. The percentage of observation intervals with chin wetness was low through the different intervention phases (i.e., including the phase with the 16-second stimulation appendix).

Lancioni et al. (2011a) carried out a study with a 19-year-old woman, who was described as being in the severe-to-profound range of ID. She was not ambulatory, had minimal residual vision, and did not possess specific forms of communication. Drooling had apparently been always present in her condition, as she usually had abundant salivation, swallowed only sporadically, and was not used to wipe her mouth. The technology was stored inside a napkin that she wore. The napkin had a horizontal folding line, and the participant could turn the lower part of it toward her mouth/chin to wipe the saliva away. In using the napkin, she was initially required to activate one of the two pres-

sure microswitches inside it. This was sufficient to turn on a microprocessor connected to an MP3 device, and thus ensure a 12-second period of preferred stimulation (music and songs). Once responding had been strengthened, an appendix of low-impact stimuli was added to the 12-second period of preferred stimulation. This appendix was gradually extended to 10 seconds so that the total stimulation period would finally last 22 seconds. During the last intervention phase, sessions in which activation of one of the two pressure microswitches was sufficient to produce stimulation were alternated with sessions in which the activation of both pressure microswitches was required. Sessions lasted 15 minutes. Data showed that the participant learned to produce the wiping responses in a consistent manner. The frequency of responses per session settled slightly above 30. The percentages of observation intervals with wet chin were always below 20 with a significant difference in favor of those recorded in sessions in which the activation of both pressure microswitches was required.

Lancioni et al. (2011b) implemented a program with two men of 46 and 19 years of age, respectively. The older man was considered to be in the severe-to-profound range of ID, presented with minimal residual vision, and had forms of echolalic speech. The younger man was rated in the severe range of ID, could understand verbal instructions, and used manual signs to make requests. Drooling had been a consistent feature for both men, given their abundant salivation and virtual absence of swallowing and mouth cleaning responses. Both participants used napkins such as those mentioned earlier, which included pressure microswitches and MP3 devices. Initially, mouth-wiping responses allowed the participants to obtain 10 or 15 seconds of preferred (musical) stimulation. Subsequently, an appendix of lower-grade stimuli was added to the preferred stimulation. The appendix, which was extended to 10 or 15 seconds, consisted of daily stimuli presented at an intensity of 15–20 dB lower than that of the preferred stimuli.

The sessions lasted 10 and 30 minutes for the two participants, respectively. Data were highly satisfactory with both participants. In fact, they were able to largely control the effects of their drooling with relatively moderate response frequencies.

Self-Management

To develop internal control over swallowing or wiping, as opposed to external social or automatic control through the aforementioned procedures, self-management techniques can be implemented. These techniques aim at teaching the child to self-monitor and self-evaluate his/her physical appearance, to self-initiate an appropriate response, and to self-reinforce both appropriate responses and appropriate physical appearance.

Data on self-management procedures for drooling were limited to two single case studies, published in the 1980s (i.e., Thorbecke & Jackson, 1982; Dunn, Cunningham, & Backman, 1987). For instance, Dunn et al. (1987) used self-control for swallowing with positive reinforcement to eliminate drooling in a 16-year-old boy with severe spastic quadriplegia. His language comprehension and nonverbal cognitive abilities were estimated at approximately 13 years. The self-control procedure contained four steps: (a) monitor mouth closure, (b) determine the need to swallow, (c) evaluate the success of the procedure in terms of drooling prevention, and (d) verbally reward himself if successful. Every 60 seconds, the boy was verbally prompted to start the self-control procedure and was allowed to take a token each time he succeeded. After reduction in drooling, reinforcement was eliminated, and prompts were gradually faded out.

More recently, Van der Burg et al. (2009) performed a center-based case-series study, in which 10 participants (aged between 7;0 and 19;9 years; developmental age above 6 years) with severe drooling were taught to perform self-management skills (i.e., self-instruction ["swallow frequently, and wipe your mouth/chin dry if necessary"], self-monitoring, self-

evaluation, and self-reinforcement) and to remain dry for increasing time intervals, starting from 0.5, 2, 5, 10, and so on minutes to a maximum of 60 minutes. Following treatment, all participants remained dry for intervals of 30–60 minutes while being engaged in daily activities. Generalization (i.e., the performance of the newly learned behaviors outside the training setting) to the classroom occurred in each participant. For three participants, maintenance of treatment effects was established at 6 and 24 weeks. However, seven participants failed to maintain self-management skills at follow-up. It was concluded that although the self-management procedure showed promising results, further adaptations were required to improve efficacy, generalization, and maintenance.

Drooling: Critical Examination of Experimental Methodology

Across studies on drooling, conclusions on the effectiveness of behavioral procedures were based on different definitions of drooling and differing measurement techniques. The definition of drooling varies widely, ranging from "saliva on lower lip," "saliva under the lower lip leading to a wet chin," to "a string of dribble falling from the mouth or chin." In addition, techniques to measure drooling vary. Although in most studies drooling was measured by direct observation, this varied from examining the participant's face to checking the therapist's finger after wiping the participant's chin. Also, while in some studies the observation period started after cleaning the mouth and chin, in others, the assessment started without first cleaning the face. Mostly, an observer evaluated the drooling severity, but in some studies, the participants themselves were involved. In some studies, the amount of drooling was measured by the weight of a bib (e.g., Burgmayer & Jung, 1983) or the quantity of saliva collected in a chin cup (e.g., Koheil et al., 1987). Furthermore, there was a wide range of activities performed by

participants during assessment. Some children performed regular activities in daily situations, whereas in other studies, they performed only a few standardized activities, not shown in their natural environment. These differences in measurement hinder comparison of results across studies.

Interobserver reliability levels for dependent measures were satisfactory in most studies. However, several studies (Garber, 1971; Rapp & Bowers, 1979; Jones, 1982; Burgmayer & Jung, 1983; Koheil et al., 1987) lacked reliability data, precluding firm conclusions on the intervention effects reported.

Both generalization to daily life situations and maintenance of treatment effects are critical factors in the choice of the intervention type. Four studies (Garber, 1971; Richman & Kozlowski, 1977; Jones, 1982; Koheil et al., 1987) did not evaluate generalization of treatment effects to daily life situations, and nine studies failed to report long-term follow-up data (Garber, 1971; Barton et al., 1977; Poling et al., 1978; Lancioni et al., 1989, 2009a,b,c, 2011a; Kay et al., 2006).

With the exception of Rapp (1980), who used a control group design, behavioral studies on drooling predominantly used single-subject designs, in which data were collected in AB design and reversal design. Eight studies used a multiple-baseline design, either across behaviors, across activities, across settings, or across participants. Although the internal validity of studies using reversal or multiple-baseline designs is relatively strong, the external validity of all studies with single-subject designs is unknown. The evidence base is relatively small because individual characteristics of participants could account for the variance in treatment success. In addition, some methodological flaws were evident. For instance, in three studies (Garber, 1971; Richman & Kozlowski, 1977; Connis & Rusch, 1980), the drooling rate already showed a decreasing trend during baseline, even before treatment was started. These methodological flaws limit the validity of conclusions.

Drooling: Guidelines for Clinical Use of Behavioral Treatment Procedures

After careful consideration of the five types of behavioral procedures for drooling and the methodological issues, some general guidelines can be given for implementation of such interventions in a clinical setting. Instructions, prompts, praise, and tangibles (tokens) for performing target behaviors such as nondrooling, swallowing, wiping, keeping the mouth closed, and maintaining upright head position remain without a lasting effect if they are only intermittently and not systematically applied. Therefore, *systematic* implementation of (a combination of) these techniques in a behavioral treatment program is recommended. Withdrawal of these procedures usually leads to return to baseline levels of drooling (e.g., Poling et al., 1978).

Self-management for drooling without social or technical support is the ultimate goal of intervention and leads to maximum independence of the individual. Although Dunn et al. (1987) and Van der Burg et al. (2009) reported effectiveness of self-management procedures, retraining and further adaptations of procedures to improve efficacy, generalization, and maintenance are required. Contraindications for the use of self-management procedures seem to be severe and profound ID and a developmental age below 4 years.

If a self-management procedure appears not effective or is contraindicated, intervention by cueing techniques should be considered. Seven studies on behavioral treatment for drooling used electronic cueing devices for swallowing or wiping, albeit with variable success. For instance, during the three studies (Rapp & Bowers, 1979; Rapp, 1980; Jones, 1982) at the Meldreth Manor School, the positive effects of auditory cueing seemed to decrease over time: while Rapp and Bowers (1979) and Rapp (1980) reported most promising results, Jones (1982) reported no significant improvement, although he used the same procedure to introduce and implement the dribble boxes. Jones further

observed a slackening of interest in the use of dribble boxes and questions about the effectiveness of the cueing device among the staff of the institute. Thus, apparently, only introducing a cueing device is not in and of itself sufficient to reduce drooling. Additional behavioral strategies such as instructions, prompts, praise, and tangibles are necessary, not only at the start of the therapy but also during the course of the treatment.

Once individuals who drool become accustomed to the cueing device, they often remain dependent on the device to remain dry. Lancioni et al. (1994) scheduled assessment sessions with and without the cueing device throughout the day. They concluded that their subjects remained dry with the cueing device, but did not when the device was not used. They proposed that some subjects may only achieve a device-assisted ("artificial") control of drooling. Without a positive attitude toward the program and substantial positive reinforcement from the social environment, these children fail to maintain the learned behavior. Therefore, before employing a cueing device, one should assess in advance if continuous cueing is acceptable in the participant's social setting, whether at home and at school or work. Since electronic devices are susceptible to breakage, an extra device needs to be at hand.

None of the studies described how optimal cueing intervals were established. Across studies, the frequency of cueing varied from once per 5 minutes to once per 15 seconds. Optimal cueing frequency was adjusted to the child's needs. It seems reasonable to assume that the child's drooling severity is a contributing factor. Those with severe drooling and/or ineffective swallowing should be cued more often than those with milder drooling. In addition, the general effectiveness of the cues (e.g., performance of target behavior after a cue) is another determining factor. Children who drool are often unable to perform dual tasks (e.g., swallowing or wiping while performing another activity). If they are allowed to miss some cues while concentrating on another task or activity,

cueing frequency should be increased. The available literature on drooling does not contain a systematic evaluation of which factors justify a certain cueing frequency. For clinical use, a cueing frequency of every 15 seconds seems appropriate at introduction of the treatment to establish the stimulus-response chain (i.e., swallowing or wiping contingent on the cue). If the child is successful in maintaining dry, the trainer can systematically increase the interval as long as the child is dry.

Microswitch technologies are employed because persons with developmental disabilities may be largely inconsistent in responding to cues reminding them to swallow or wipe their mouths. In fact, they may not be sufficiently motivated by the positive social attention of staff and parents contingent on their responding. However, the kind of rewarding stimuli (i.e., music, visual stimuli) used in some of the studies are not applicable in persons who are participating actively in social interaction at school or in the family. For persons with developmental disabilities who function in the severe-to-profound range of ID, these microswitch techniques are promising.

Although overcorrection was also reported to be an effective treatment option for drooling, its aversive nature makes its use socially acceptable only if the nonaversive procedures described earlier have been shown to be ineffective. However, a careful evaluation of the undesired side effects resulting from this kind of procedure should be conducted.

Treatment should be focused on reducing drooling while the child performs a variety of his/her daily activities (e.g., Dunn et al., 1987). However, generalization of learned behaviors to a variety of different daily situations and activities is often a problem in individuals with severe ID and, therefore, has to be assessed and fostered. For some participants, drooling returned to baseline level after intervention. If long-term follow-up data are collected, the need for supplemental training ("booster sessions") to reinstate the initial treatment effect can be assessed. For instance, in the study by Dunn

et al. (1987), the initial treatment effect remained stable at 3 months follow-up, but a booster training was necessary at 6 months to reinstate the effect, which was then maintained for another 6 months.

Tongue Protrusion: Definition, Prevalence, and Cause

Tongue protrusion is often defined as the tongue sticking out of the mouth. Though tongue protrusion may be observed in individuals with ID, no studies have been published on its prevalence yet. It is often conceptualized as a type of stereotypic behavior which does not result in an immediate health hazard but which still may have adverse consequences on social image and interactions for the individual involved. There are several causes for tongue protrusion. In some cases, such as in individuals with Down syndrome, the tongue may be relatively large, which may increase the likelihood that it is protruded. Next to this, individuals often lack self-management skills to keep the tongue in their mouth. Also, general muscle hypotonia may contribute to the protrusion (Purdy, Deitz, & Harris, 1987). Finally, tongue protrusion may be maintained by social and/or sensory stimuli.

Tongue Protrusion: Description of Treatment Procedures

Six studies have appeared on the effectiveness of behavioral treatment procedures for tongue protrusion in persons with ID. One of the earliest studies was published by Kauffman, Hallahan, and Ianna (1977) who assessed the effects of contingent imitation on tongue protrusion in a 12-year-old child with moderate ID who visited a special public school. He showed this behavior most often during academic exercises requiring concentration (e.g., reading). Praise for keeping the tongue in his mouth and prompts had remained ineffective. His teacher implemented the treatment package. Contin-

gent upon tongue protrusion, his teacher would hold the child's head so that eye contact was assured and imitated the child's behavior. Later on, the teacher refrained from imitation but gave a physical prompt (grasping the child's cheek) each time the child showed the target behavior. This prompt was eventually modified in that the teacher touched the child's chin lightly with her index finger. Imitation was immediately effective in reducing the level of tongue protrusion to near-zero levels which were maintained when only physical prompts were given.

Self-monitoring was used in a 24-year-old female with Down syndrome who functioned in the moderate range of ID and who attended a community work activity center (Rudrud, Ziarnik, & Colman, 1984). She learned to discriminate between "tongue-in" and "tongue-out" using a mirror. She was taught to self-monitor whether her tongue was out or in using cassette tapes that produced a beep at variable intervals. Progression to tapes with fewer beeps occurred after she exhibited two consecutive days of zero levels of tongue protrusion. Eventually, the cassette player was removed from her workstation after five consecutive days without tongue protrusion. She was given verbal reminders to keep her tongue in when she arrived at work and after lunch break. This approach resulted in zero levels of tongue protrusion, and effectiveness was maintained at 3- and 5-week follow-up at which the self-monitoring procedure was faded out.

Luiselli (1984) used a brief overcorrection procedure for tongue protrusion of a 19-year-old female with severe ID. Overcorrection was implemented during speech therapy sessions and consisted of 15 seconds of overcorrection which consisted of wiping lips/mouth with a tissue contingent upon tongue protrusion. The participant was praised when her tongue was in her mouth. The treatment package was effective, and effects were maintained at follow-up.

In 1987, Purdy et al. evaluated effectiveness of a behavioral procedure and oral-motor treatment in six young children with Down

syndrome. Three children were assigned to the oral-motor treatment whereas the other children were assigned to the behavioral procedure. Oral-motor treatment consisted of six steps, and included cheek and tongue tapping, stroking the lower and upper lip, and brushing and icing. During the behavioral procedure, the therapist gave a verbal prompt to put the tongue into the mouth, and the child was praised when his tongue was not protruded. After several days of treatment, the therapist took away any toys and did not pay attention to the child contingent upon tongue protrusion. Parents learned to implement either the oral-motor or the behavioral procedure at home. Results showed that both treatments were effective in reducing tongue protrusion. The mechanisms responsible for the effects of the oral-motor treatment are unclear. Purdy et al. (1987) hypothesize that this approach may increase muscle tone in the oral-facial area.

In 2005, Lancioni et al. published a study on the effectiveness of automatically delivered auditory prompting in a 39-year-old woman with severe to profound ID who visited a day activity center. She was provided with a device which consisted of an optic sensor (i.e., mini-photocell kept under the lower lip with a small piece of medical tape), a small signal transmission box, and a Walkman worn at her chest. Activation of the optic sensor by tongue protrusion turned on a Walkman for about 5 seconds as a result of which a sentence with a prompt to withdraw her tongue was emitted. Next to this, a research assistant praised her about every 2 minutes for absence of tongue protrusion. In the baseline, she showed tongue protrusion in more than 50% of the observation intervals. Treatment resulted in near-zero levels of the target behavior. These effects were maintained even after praise was eliminated from the treatment package. The results also showed that when she did not receive prompts, the level of the target behavior increased substantially.

Recently, Lancioni et al. (2010) investigated the effectiveness of a treatment package on stereotypic tongue protrusion in a 43-year-old

female who functioned in the severe to profound range of ID. Pretreatment interviews with staff members and direct observations by the researchers indicated that this behavior occurred in a variety of situations: when she was alone and with others, when she was engaged in an activity, or when she was passive. As a result, it was concluded that her tongue protrusion was not maintained by social events. Despite her ID, she was able to follow simple instructions and prompts by staff and seemed to enjoy social events. The package consisted of automatic prompting and social approval. Automatic prompting was delivered through a Walkman located in a pocket at her chest and which presented a prompt every 60 seconds to keep the tongue in her mouth. Social approval consisted of a research assistant providing approval at intervals of 2 minutes. The delivery of the approval was postponed if she was showing tongue protrusion. Postponement lasted until a period of at least 10 seconds has elapsed during which she did not show this target behavior. Effectiveness of the treatment was assessed during daily sessions of 60 minutes, and data were collected within a reversal design in which treatment conditions followed the baseline conditions. As a result of intervention, her tongue protrusion declined from 50% of the observation intervals during baseline to about 10% of such intervals during the treatment, and effects of the intervention were maintained during the follow-up. The 10%-level was attained after seven treatment sessions.

Tongue Protrusion: Critical Examination of Experimental Methodology

Conclusions regarding effectiveness of behavioral treatment procedures for tongue protrusion are solely based on outcomes of single case studies. However, most studies were well controlled in that data were collected in a reversal design or multiple baseline design. Behavioral

procedures were employed most often. Participants functioned in the severe to moderate range of ID, some of whom had Down syndrome. Maintenance of effectiveness was assessed in most studies, and results showed that reduction in tongue protrusion was maintained following treatment. All studies reported interrater reliability of recording, except one (i.e., Lancioni et al., 2005). Generalization of effectiveness across settings and carers was evaluated in only a minority of studies. Only one study explored effectiveness of two treatment procedures for tongue protrusion (see Purdy et al., 1987), but the small number of participants preclude conclusions on their differential effectiveness. In all studies, treatment packages were used, and it is unknown which treatment component contributed to the reduction in tongue protrusion.

Tongue Protrusion: Guidelines for Clinical Use of Behavioral Treatment Procedures

A functional assessment procedure should be performed prior to starting a behavioral treatment for tongue protrusion. During functional assessment, events that elicit and maintain this behavior may be identified. Function-based treatments are directed at modifying antecedents and consequent events to reduce or eliminate the target behavior.

If no antecedent or consequent (social) events can be identified, behavior modification techniques may be employed. A technique aimed at interrupting and redirecting the participant upon tongue protrusion may be used next to differential reinforcement for "tongue-in." Verbal and physical prompts may be necessary to teach the person to keep the tongue in his mouth and to elicit an alternative response. A preference assessment should be used during which reinforcing stimuli are identified. Also, devices that deliver prompts automatically may be used.

Individuals who are able to self-monitor their own behavior may benefit from discrimination training that increases awareness on their tongue protrusion. They may learn to self-monitor their own behavior and as a result may need low levels of adult prompts.

Conclusion

Given the potentially adverse consequences of drooling and tongue protrusion, treatment is warranted. For drooling, various treatment strategies have been reported in the literature, such as oral motor training, proper positioning, behavioral treatment, the use of intraoral devices, medication, and surgery (Blasco & Allaire, 1992). However, there is general agreement that behavioral procedures to treat drooling should be considered before other, more intrusive treatments like medication and surgery are implemented (Blasco, 2002; Brei, 2003; Meningaud et al., 2006). Treatment strategies for tongue protrusion include palatal plate therapy, behavioral treatment, and surgery. Although few studies on treatment of tongue protrusion have been published, like for the treatment of drooling, behavioral procedures should be applied before surgery is considered.

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IV

Professional Practice

18

Listening

Bruce Peltier

Key points

- Good listening is essential to an effective practice.
- Hearing and listening are not synonymous.
- Most dental practices would benefit from better listening skills.
- Common barriers to good listening can be identified and modulated.
- Key listening skills described in this chapter are relatively simple and can be learned.
- Current trends in dental practice make it challenging to communicate with patients.
- Patients judge dental care, in large part, on the basis of psychosocial factors.

Few people . . . have had much training in listening. The training of most over verbalized professional intellectuals is in the opposite direction. Living in a competitive culture, most of us are most of the time chiefly

concerned with getting our own views across, and we tend to find other people's speeches a tedious interruption of the flow of our own ideas.

—S.I. Hayakawa (1963, p. 32)

Apparently the act of attending carefully to another person is a difficult task for most people.

—Carl Rogers (1951, p. 349)

While much has been written about the obvious importance of listening in everyday life, there is precious little to be found in dental literature, in spite of the fact that dental patients typically judge the quality of dental care on the basis of social rather than technical factors. Patients really don't know how to evaluate a crown or a filling, but they very much know how they were treated and how they felt.

This chapter reviews what we know about listening in the doctor–patient relationship, describes the benefits of good listening along with common barriers, and prescribes several learnable methods to improve listening skills. It describes the essential skills involved in good listening, including the active listening skills such as restatement, paraphrasing, reflection, summarizing, physical listening, and listening for feelings. Common tendencies, errors, and barriers are described, along with ways to grow out of them. The “listening attitude” is described. Examples of effective prompts are provided (“tell me more . . .”). Open- and closed-ended questions are described as well as laundry-list questions, probing questions, and the use of positive reinforcement. The chapter is written to help dentists and their teams evaluate and improve their clinical listening skills.

Listening is one of those curious things in life where virtually everyone sings its praises yet few actually take the time and effort to assess and improve their skills. Most people—and dentists can certainly be this way—seem to think that since they have functioning ears they know how to listen. This is hardly the case, and everyone knows people who just don't seem to “get it.” In fact, many people think that they are better listeners than they really are.

Michael Nichols, a psychotherapist and author of *The Lost Art of Listening* wrote that his many years of practice led him to the conclusion that “much of the conflict in our lives can be

explained by one simple but unhappy fact: we don't really listen to each other” (Nichols, 1995, p. 1). Truly good listeners are rare and precious. The issue of poor listening skills is a problem that hides in plain sight. The old Mark Twain quote about the weather is applicable: *Everybody talks about the weather, but nobody does anything about it.*

While most dentists would endorse the notion that listening skills are important to effective practice, dental education provides little or no curriculum time, and dental school applicants are not typically selected for their social skills. Continuing education related to these topics is rare, and training is hard to find outside of expensive consulting firms. As a result, the quality of listening in clinical dental practice is uneven at best.

Hearing sounds is one thing; hearing the message is something else entirely. Kratz and Kratz (1995, p. 2) provide a useful definition of listening: “The act by which we make sense of sounds.” Igor Stravinsky famously noted that “To listen is an effort, and just to hear is no merit. A duck hears also.” Appointments in health care involve the meeting of two people, each expert in his or her own domain. Doctors are experts in specialties such as medicine or dentistry; patients are expert in the nature and qualities of their own lives, their values, wishes, fears, and goals. Information from both domains must be included in discussions and decisions.

Listening in Health Care

It rather amazes me how often a new patient says, “My dentist doesn't listen to me!” Last week may have been a record with six or seven new patients in a row sitting in my consult room and complaining, “My dentist just doesn't listen!”

—William Halligan, DDS (2012)
(<http://halligantmj.com/>)

The challenge of listening is larger than dentistry itself. In a review of two recent books on

the communication of global warming to the public and policy makers, Peter Kareiva concludes that the authors “underemphasize the single biggest reason why scientists are often such ineffective communicators. The failure of scientists as communicators is that they do not know how to listen, especially when it comes to the ‘uneducated public’. Brilliant scientists can be stunningly dumb when it comes to dealing with people” (Kareiva, 2010, p. 35).

Robin Wright’s observation is a good place to start the assessment of the state of current affairs: “If you are like many dental professionals, your treatment is better than your talk about treatment” (Wright, 1997, p. 2).

Much of what we know about communication in the doctor–patient relationship comes from medical literature. In contrast to dental practice, most of what happens in typical medical appointments is talk. Dental appointments usually consist of procedures; talk can be seen as superfluous sometimes. Nonetheless, there is a good deal to be learned from the available medical literature. Much of the information in this section comes from a highly recommended text by Debra Roter and Judith Hall titled *Doctors Talking with Patients; Patients Talking with Doctors* published in 2006.

It seems that communication in the physician–patient relationship began to deteriorate when effective sulfa drugs were introduced into medical practice in the 1930s and antibiotics (“the antibiotic revolution”) in the 1940s (Roter & Hall, 2006). Psychiatry was transformed—for better and for worse—with the introduction of effective antipsychotic medications in the 1950s. The role of the doctor shifted from teacher–healer to detective–prescriber, resulting in the brief, no-nonsense, business-like patient appointment typical in 2013. Dental appointments tend to be like this. But dentistry’s identity as a profession depends upon communication skills, for without them, dentists are relegated to the role of tooth technician or mouth mechanic. If dental practice is to evolve from a heavy (sometimes exclusive) emphasis on restoration to a more preventive focus, effective

communication skills will be mandatory. That said, even from the most narrow restorative view, dentists know that most of the difficulties of dental practice are related to mismatches or misunderstandings between people, not problems of a technical nature.

Add to all this the fact that dental appointments are typically anxiety provoking for patients—and often for doctors. Anxiety about dental treatment is extremely common, and studies have noted that anywhere from 46% to 75% of the population suffers at least some dental anxiety (Robbins, 1962; Milgrom et al., 1988). Roter and Hall (2006) observe that “Encounters with doctors are highly charged . . .” (p. xiv).

The seminal research on the impact of communication on patients in dental practice was done by the late Norman Corah who spent much of his career studying dental anxiety and developing questionnaires to measure it. In a 1985 study (Corah, O’Shea, & Bissell, 1985), he used an instrument that included questions on injections, the drill, probing for gum disease, scraping while cleaning, the rubber dam, and gagging, along with psychosocial aspects. He found that the following factors had the most powerful impact on patient satisfaction (not necessarily on anxiety):

- having a calm manner
- saying reassuring things
- taking seriously what the patient had to say
- telling the patient what was to be done
- encouraging the patient to ask questions.

It is interesting to note that while all the positive behaviors of dentists helped somewhat with patient satisfaction, the most powerful ones were psychosocial.

The notorious notion that doctors interrupt patients early and often is well-known. Studies by Beckman and Frankel (1984) and Marvel et al. (1999) revealed that physicians typically (69% of the time) interrupted or redirected patients’ opening statements after an average of only 15–18 seconds (Roter & Hall, 2006). When patients were not interrupted, it turned out that

they needed only 2.5 minutes to finish their story. Researchers also found that the first concerns mentioned by patients were not typically more important than concerns to be expressed later in the meeting. This implies that doctors never actually hear the issue that matters most to their patient.

Roter and Hall (2006) also observe that patients have theories about what has caused their health problems. It is likely that many dental patients hold incorrect views of oral health, caries production, bruxing, and home care. It would be helpful for dentists to know what patients think about these things in order to address them accurately. It is not helpful when dentists perceive that discussions are a distraction from the *real* business of dentistry, that of restoration. Patients can sense this attitude, but without encouragement, may keep quiet in order to be seen as a "good patient."

Patient "noncompliance" is a huge issue in health care. Research indicates alarmingly high levels. A recent meta-analysis of patient adherence patterns by Martin et al. (2005) revealed general levels of patient nonadherence to be between 40% and 70%. Controlling factors were cognitive components, such as health literacy and beliefs (including misunderstandings), memory problems, the use of medical jargon, patient attitudes, cultural variations, and interpersonal problems between doctor and patient, especially a patient perception that their doctor is uninterested in them. They note on page 192 that "Patients who feel that their physicians communicate well with them and actively encourage them to be involved in their own care tend to be more motivated to adhere" (Frankel, 1995; Safran et al., 1998; Martin, DiMatteo, & Lepper, 2001; O'Malley, Forrest, & Mandelblatt, 2002). They reported that "Adherence rates have been found to be nearly 3 times higher in primary care relationships characterized by very high levels of trust coupled with physicians' knowledge of the patient as a whole person" (Martin et al., 2005, p. 193).

Knowing the patient as a person allows the health professional to understand elements

crucial to the patient's adherence: beliefs, attitudes, subjective norms, cultural context, social supports, and mental health challenges, particularly self-concept and depression. What would be the point of telling a patient to brush and floss more when that patient does not know how to do those things properly and the dentist is unaware of that? What's the point of oral health instruction if the patient (silently) thinks to himself or herself, "That sounds like too much work for me. Plus, why should I bother when I know I'm going to end up in dentures anyway?"

Dental patients can be intimidated by doctors and the power that they seem to hold. When they perceive that the dentist is hurried, or in some other way disinterested, patients sometimes withhold information, and may even become passive-aggressive as a result. Cut off from direct communication, they resort to tardiness in arrival for appointments or in payments or even to litigation. They sometimes simply disappear.

The connection between communication and litigation is not speculative. One study reported in Roter and Hall (2006, p. 37) found that "sued doctors, in contrast to those who had never been sued, spent less time, were less likely to use humor in their visits, and were less likely to solicit patients' opinions about care or check that patients understood information" (Levinson et al., 1997). Another study revealed that communication problems were present in 70% of malpractice depositions (Beckman et al., 1994). Roter and Hall (2006) wrote that "physician dominance is also related to the likelihood that a physician has been involved in a malpractice claim" (p. 150).

Research indicates (Roter & Hall, 2006) that visits to physician offices actually seem to be getting a bit longer (from 1991 to 2001) and that female doctors and female patients tend to spend more time in appointments. Patients in the morning tend to get more time than patients seen in the afternoon. They note that doctors typically talk more than patients, but those same doctors overestimate the amount of time

that patients talked. They found that patients generally tend not ask questions, and their review of nine studies revealed that only 6% of interactions included patient questions.

Professional jargon obviously inhibits good communication. While doctors often use highly technical language, Roter and Hall (2006) report that patients told their doctor that they did not understand a medical term in only 15% of appointments. "They simply remained silent" (p. 128).

Dentists must also remember that patient interest in information is highly variable. Some patients desire a lot of information while others actually hate it. Roter and Hall (2006) cite Miller and Mangan's (1983) classification of "information seekers" and "information avoiders." It's essential for dentists to match their approach to the need of the patient in their chair. The provision of extensive, ongoing information that would be welcomed by seekers is abusive of avoiders. This requires careful attention to your patient and perhaps an overt inquiry about how much information your patient desires.

Roter and Hall (2006) reviewed extensive literature and concluded that "patients do not generally like physicians who are very dominant" (p. 151).

Barriers and Bad Behavior

An inability to listen will be judged harshly.

—Stanley Weiss (2004, p. 108), DDS

There are two kinds of barriers to effective listening in dental practice. The first is structural and global. The second consists of specific, personal micro-behaviors that get in the way.

First of all, dental students have traditionally been selected along factors that do not emphasize communication, especially listening. High grades in physical sciences, high Dental Admissions Test (DAT) scores, and exposure to the profession tend to be emphasized, although this trend is clearly changing. Many dental admissions offices are now quite interested in the psy-

chosocial skills of prospective students, and large applicant pools allow them to select students who possess high technical scores as well as excellent interpersonal skills.

Dental schools do not place a high priority on social skills training, especially when compared to the time spent on technical skills, reinforced by the grading structure. While communications instruction is offered more than in the past, the implicit message to young dentists is clear: hand skills are crucial; communication skills are important, but you can pick those up along the way. Along the way, one finds precious little continuing education for enhancement of listening skills. To be fair, dental school curricula are currently bulging at the seams with the demand for essential knowledge and skills. So, it's up to dentists to learn how to listen on their own. This can be a problem when dentists view their role as technician or toothfixer more than doctor or healer.

Time is money. Most dental practices strive to be efficient. No one wants to waste time or spend more time at work to make less money. Listening is often—unfortunately and incorrectly—viewed as a kind of speed bump on the highway to success. The forces toward faster practice seem more powerful than ever, and on the increase, especially if large efficient corporate practices continue to penetrate the market place.

The dental operatory is a terrible place for a conversation. There are unfamiliar noises, frightening-looking equipment and instruments, strange smells, and the people wear masks and bizarre eye glasses. There's little room to maneuver, and keyboards, monitors, and X-ray illuminators demand attention. It's often convenient to talk to a patient while towering above them as they recline in the chair.

Some patients are difficult to listen to. A few talk endlessly about matters of no interest to you. Often they do this because they are afraid of what is about to happen. Anxiety makes many people chatter. Other patients take the opposite tack: they get silent. It is easy to wonder if the silent ones are angry or disengaged, but

impossible to know without inquiry. Some patients are lonely, and dental appointments are their big social event of the week. Many feel free to say the most insulting things to dentists and their teams, such as “No offense Doc, but I hate coming to the dentist.” Some complain about everything, including your fees (dental care *is* expensive), partly because they are complainers and partly because they feel some vague, not-in-control, victim status in the dental office. Some resent the sense that they are in a one-down position to the important doctor, so they strive to level things out with sarcasm and manipulative hostility. Many, of course, are simply lovely people and terrific patients.

Sometimes doctors do not really want to hear what patients have to say. When a treatment is not working, when a patient is still in pain, it is hard to listen. The message is bad news, and it implies that the doctor is inadequate or is failing, and who wants to hear that?

Some patients do not expect dentists to listen. They’ve been conditioned to take a passive role as a patient and to simply sit down, open up, and do as they’re told. It may take a bit of extra time and effort to convince them to participate. Some have a traditionally paternalistic view of the patient role. Others are anxious and would simply prefer the appointment to move along as quickly as possible, without much verbal exchange. Others are wary of feeling inadequate in response to all of the dental jargon flying around. They don’t ask questions that might make them seem dumb, so they nod and say nothing.

Cultural differences can make good listening more complicated. Norms about interaction and conversation vary, and they can lead to misunderstanding. Some cultures value individual and patient autonomy more than others. All cultures have rules about how to interact with authority figures, and they include rules about eye contact, tone of voice, physical touch, interrupting, and waiting your turn to speak. Cultures vary in how people view directness in conversation. Indirectness can be a required sign of respect, but it can confuse a dentist from

a more direct culture. Some patients need a clear invitation to articulate a personal preference or something that might be perceived as a complaint. Patients may just nod their head in seeming agreement when they actually do not agree at all but do not want to disrespect their doctor. Gender roles make the unspoken rules all the more complex. Some patients may be uneasy about speaking because they are embarrassed about their accent in English. These challenges make skillful listening that much more important. The dentist must listen with ears, eyes, mind, and experience, and might even recruit a cultural interpreter to help. Thankfully though, most people will excuse your social or cultural faux pas if they perceive that you care about them.

There are also specific personal behaviors that get in the way of good listening. For example, it does not help to ask a speaker a steady stream of questions that keeps attention exclusively focused on them. *Machine-gun questions*, as mentioned before, can feel like an interrogation. This can become very one-sided and uncomfortable. Strive for some mix of attention, ensuring that it mostly stays focused on your patient and his or her needs.

Rehearsing is a common barrier to effective listening, and it is hard to imagine a person who does not do this from time to time. When you are using your mind to prepare your own response to a speaker, you simply cannot hear their message in any deep or accepting way.

Derailing is especially distressing, even rude. It occurs when a listener responds by moving the topic of conversation away from the speaker’s topic onto his or her own. It’s a variation of “mine’s bigger” without the competitive motive. “Oh, yes. I had that happen once, but in my case. . . .” There is a rather fine line between trying to connect with the speaker through commonality and derailing the conversation to a different topic about a different person. Similarly, *redirecting* happens when the listener intervenes to move the topic in a different direction aligned with the listener’s interest. When this happens, the listener is well-advised to get

the focus back onto the speaker as quickly as possible to recover.

Daydreaming happens to all of us from time to time, and it is deadly. Planning your next move is an associated distracter that is common in dental practice. It is tempting for your mind to drift off to thoughts about how to accomplish restorative tasks when a patient is in the chair. Big chunks of a message can be missed completely, leaving embarrassing gaps. While it is crucial to catch the daydream early and discipline your mind, sometimes the only way back is to confess: "Sorry, tell me that part again please. I didn't quite get it the first time you said it." People usually don't mind when you do this, and they might even take it as a sign that you are really interested, especially if it doesn't happen often.

Filtering occurs when you listen with a bias toward a particular point of view. If you have something to prove and you listen for comments that you can use to buttress your argument, you will certainly miss out on important parts of the speaker's message, and you are unlikely to be viewed as sympathetic or empathic.

Offering suggestions or fixing problems is a frequent barrier in dental conversations, as dentists know a lot about dentistry. They are in a problem-solving role in their practice, and they tend to be problem-solvers, anyway. Sometimes a "helpful" suggestion, especially when it is poorly timed or premature, can be distracting at best and insulting at worst. It's a good idea to allow speakers to finish their thoughts before jumping in to fix things. Sometimes they've already considered or attempted to do the things suggested, and sometimes they really just want a caring audience. Most people rarely appreciate being told what to do.

"Why?" This question or prompt can be useful, but it can also be a problem if it comes across as an accusation. "Why did you do that?" is likely to result in defensiveness and close the door on a discussion, especially if the speaker doesn't actually know the answer to that question. Be careful with this word ("why"). It can

imply that the speaker has done something wrong or is in some way inadequate.

While interruptions are generally rude and are a bad idea, the matter is complicated, as some patients *must* be interrupted if the dental appointment is going to proceed in a timely fashion. Like many important things in life, judgment and timing are crucial. At some point, dentists have to say—sometimes while a talkative patient is in mid-sentence: "OK. I'm going to lower the chair now. Open wide and we'll get this filling done."

The last prohibition is classic. While questions are certainly recommended as a way to open patients up, to learn more about them, and to show that you care, be careful about asking questions of a person with a mouthful of dental instruments. Questions under those conditions can be OK, but only if they can be answered with a simple nod or grunt.

Benefits of Effective Listening

The benefits of good listening far outweigh any associated costs, such as time and effort. There is a life-long listening learning curve, however, and it pays to stay on the path of the learner throughout one's career.

First, good listeners are typically perceived to be smart and perceptive; big talkers lose respect after a while. You can't talk people into believing that you are smart. That said, good listening is not the same thing as simply being quiet. Quietness is often a good thing, but good listening is an active interactional process.

Good listening is likely to produce higher rates of treatment plan acceptance. Patients will feel respected and more likely to view suggested treatments as appropriate responses to their unique needs. As Nichols (1995) puts it, "Being heard means being taken seriously" (p. 17).

Patients are likely to feel more comfortable in the operatory, the appointment, and the practice when you listen. You seem to be on your patient's side and not "against" them. You're

not such a stranger. Patients will have a better overall experience and may be more comfortable during dental procedures. They will feel a greater sense of control and less loss of control if they know that their dentist listens to them. They may decide that you really want to know what is on their mind. Wright notes that patient satisfaction is based mostly on the communication skills of healthcare providers and cites research to support her claim (Daly & Hulka, 1975; DiMatteo, 1979; Thompson, 1990).

Patients are more likely to refer to a practice that listens.

Effective listening reduces miscommunication. This streamlines practice and reduces error and redoes.

Good listening modulates passive-aggressive patient behaviors, such as late appointments, missed payments, and complaints to friends and family about things that they never mention to the dentist. Patients who do not feel heard sometimes refuse to be satisfied. You can never quite get that crown to feel or look right. The problem is often psychosocial rather than technical.

As mentioned, patients who feel liked and respected by their dentist file fewer lawsuits.

A listening culture creates a more comfortable place to work. People get along better and find more enjoyment in their work. Less time is wasted on squabbling. Rumors and triangulation are reduced.

Finally, patients have differing value structures, and it is impossible to know these values without careful listening and attention. Patient value structures are crucial because the dentist's approach must be matched to them. A mismatch can cause confusion and baffling dissatisfaction. There are six major factors that dental patients value to greater or lesser degrees. They are

- money
- physical pain or comfort
- time
- function and quality of restorations
- esthetics
- psychosocial comfort.

There are obviously many other patient values, but these six must be tended to by the dental office. If, for example, a dentist assumes that his patient cares most about the quality of a crown (as dentists themselves tend to do), he might sing the praises of that crown, citing the high quality of gold, the precision laboratory, and how great it will look in the patient's mouth (esthetics). But, if his patient has *money* as an overwhelmingly important value, she may be intimidated by the potential cost. If the dentist does not figure this out, such a patient may simply not show up for the final appointment, especially if this patient does not think that her dentist is interested in listening to her. Dentists are troubled by such behavior and often react by blaming their patient for mysterious unreliability. The alternative, of course, is to learn patient values and speak to those. In the above-mentioned case, the dentist could focus on how the quality of the crown will result in cost savings over the long life of the restoration and then listen to their patient to learn of their reaction.

Effective Listening

. . . the simple art of listening isn't always so simple.

—Michael Nichols (1995, p. 3)

Good listening involves an attitude. The "listening attitude" is one of curiosity about others in place of a desire to impose one's own viewpoint. It is an essential interest in what is going on outside of self in a nonjudgmental way. The listener strives to know others—ahead of being known. It is an attitude of "wonder." This attitude finds other people unfailingly interesting and that makes the relationship world rich, indeed.

The first, most important thing to remember about listening is this: hearing sounds and listening are not the same thing. One can define "listening" in any number of different ways, but for the purpose of this chapter, listening will be

viewed as *something that a person does (actively) to better understand the viewpoint of another person*. Listening is something that you do . . . with the intention to learn and understand.

Second, it is not enough to simply hear what someone says. It is at least as important, if not more important, that the speaker perceive that they are being listened to. You must *seem* like you are listening. There is a theatrical component to good listening. This is an essential part of the listening activity because it sends the message that you care and that the speaker matters to you. This second requirement can be difficult in the fast-paced world of dental practice, but as the psychiatrist Scott Peck noted, “You cannot truly listen to anyone and do anything else at the same time.” You have to *show* that you are paying attention.

There are three essential attitudes required for good listening. They all involve a shift:

1. a shift in focus from *what you know* to *what they mean*
2. a shift from a desire to *be known* to a desire to *know the other person*
3. a shift from trying to illuminate or change the other person to an interest in accurately understanding their point of view.

In other words, you have to take a serious interest in the other person and their way of seeing things. This requires—and enhances—empathy, an essential doctor quality. It also requires that the doctor be fully present in the doctor–patient relationship, careful about mental or physical distractions that lead away from rapport. This is obviously a challenge in dental practice where there is so much to do, typically under a perception of time pressure. The key is to take time to *only* listen—to do nothing else but listen to a patient. Once this is done, long enough and often enough, listening while accomplishing other physical tasks is then likely to be effective. No patient seriously expects a dentist to do nothing but listen during a dental appointment, and it only takes a minute or two of focused listening to communicate respect and a caring attitude. But, an appoint-

ment where the dentist listens to a patient only while readying instruments or viewing radiographs is a poor idea. In spite of the good intentions of the dentist, patients are likely to feel disconnected and insignificant.

A third essential attitude is one of support rather than competition. Competitive responses, of the genre “Mine’s bigger or better” or “My grandchildren are cuter than your grandchildren” tend to crush rapport and empathy. Quash the impulse to respond to a patient’s description of their vacation with a report about your (nicer) one. Such comments can seem like a good way to connect with the speaker by demonstrating commonality, but the risk of one-upmanship is significant.

It also helps to talk less. You can’t listen when you are talking. Most of us are excited about our own ideas and needs, but those simply have to wait sometimes, especially in your professional role. Do not assume that patients are all that interested in a dentist’s personal life or hobbies or practice innovations. Stop talking and give patients time and space to speak. This is a simple thing to monitor and change. Many people fall into one of two categories: those who find speaking stressful and those who find silence stressful. It is hard to be silent (to listen) if you find silence uncomfortable. You can’t wait to speak. As soon as you start speaking your tension is relieved and you feel comfortable again. When others speak, tension builds with your nervous system and you become uncomfortable again. Notice your own tension levels and see if you fall into one of these categories.

Sometimes people need space in a conversation in order to build the courage to talk. Sometimes people need a moment to think. An empty space in conversation may feel awkward at first, but it can send the essential message that it is OK—even preferred—that patients talk. Dentists and their teams have a responsibility to provide “role induction,” overt and covert instruction about the appropriate roles of patients and doctors. Many dental patients have been previously taught not to speak much

during appointments, and need to be encouraged to engage and participate actively in future appointments as a way to enhance care.

Facilitating responses are helpful to encourage the speaker. Simple prompts or probes can be powerful, such as,

"Tell me more."

"Wow."

"Huh."

"That's really interesting."

"I didn't know that."

"Say more."

"Go on."

"Really?"

"That makes a lot of sense."

and finally, "That's right."

You can also follow a patient comment with a connecting response, such as "Oh, right. Last time you were here you said that you were thinking about an electric toothbrush. What did you decide?" or "I remember that your daughter was playing in the state championship. How did that come out?"

Simple head nods provide encouragement as long as they are not overdone. A steady stream of head nodding can become meaningless or even irritating. Save head nods for key moments and use them sparingly, but use them. A listener must consider whether they want to encourage or discourage more talk from the speaker and reinforce accordingly.

There are other simple responses that generally ought to be avoided, as they can send a message that is the opposite of the intended one. For example, the response "I understand" can be interpreted as "I don't want to hear any more" or worse ("Shut up"). In the same way, an attempt to soothe ("Don't worry" or "It's not that bad") can come across as dismissive and disrespectful. Reassurance can interfere with listening and hearing. Sometimes listeners actually say reassuring things to soothe *themselves* rather than the speaker.

Different types of questions can encourage or discourage patient input. It is important to remember the distinction between an open-

ended question and a closed one. Closed-ended questions can be answered with a simple "yes" or "no" response, and they don't tend to keep a conversation going. They don't allow the responder to expand on their answer. A series of closed questions can actually feel like an interrogation, which degrades rapport for sure. The question, "Do you brush and floss?" is likely to produce little information of value, and it may actually send the message that the provider really doesn't care about the answer, but is asking only as a matter of routine. Open-ended questions invite (or require) that the speaker reveal information that *they* can volunteer. Once again, the listener must be silent and provide ample time for a thoughtful response to an open-ended question. Some examples include:

"How do you _____?"

"What do you _____?"

"Tell me about _____?"

Other examples include "Tell me what you do to take care of your teeth and gums?" or "How do you feel about your teeth and oral health?" or "How do you feel about getting dental care?"

Closed-ended questions have their place in practice, especially when the practitioner needs a concise answer to a specific question ("Did you eat or drink anything after midnight?" or "Do you have someone here to drive you home?"). A laundry list of specific questions has a role in dental practice, and the question of "How much does it hurt, on a scale of 1–10?" can be invaluable.

I recommend that most or all dental appointments begin with the following question: "What's your understanding of what we are going to accomplish today?" Dentists may be astonished at what they hear, and may get a chance to clear up significant misinformation.

Types of Listening

There is a set of important skills called "active listening." They are called "active" because

they require action on the part of the listener. Listening is viewed as an active rather than passive process, and the skills force listeners to engage. Graduate students typically roll their eyes and underestimate the profound power of this skill set (as did I). There are many models and types of active listening, and the reader is encouraged to explore other approaches and to tailor them to his or her own personality style.

Physical Listening

This component simply requires that you position yourself physically so that you can focus clearly and appear that you are interested and open to what the speaker has to say. The trick is to be congruent. If you ask a question and want to encourage a thoughtful and honest answer, you have to create a physical situation that matches your desire. This includes the physical environment (and dental operatories can be terrible places for conversation), your facial expressions and eye movements, your posture, your hand and arm positioning and movement, your overall amount and speed of body movement, and even your grooming. Good listening can be difficult for “fast-twitch” people—those who do everything with physical quickness. It is important to slow down to listen, and improved listening skills often result in a general slowing down of behavior. Become conscious of the things that you wear on your head, neck, and face. (It is a hassle, but if you intend to have a serious conversation with your patient, remove your loupes and mask first. Conversing with these things on your face sends a subtle message that the interaction is secondary to the “real” work of prepping crowns and “drilling” teeth.) It is incongruent to say to someone “I’m listening” while you are turned away from them and looking in a different direction. Your verbal message says one thing, but your physical message says the opposite. You may actually be able to hear them, but you do not *seem* to be listening, and that sends an important message that overrides what you hear. This confuses people and can alienate them. It comes across as insincere, even when

you are quite sincere and trying your hardest to do good work and please your patients. It’s better to say, “Hold on. Let me finish with this X-ray and I can give you my undivided attention. I really want to hear what you’ve got to say.”

While there are stereotypes about physical barriers to listening, little research supports absolutes, such as the prohibition against crossing one’s arms. Preliminary research with robots (DeSteno et al., in press) indicates that humans tend to make decisions about trustworthiness based upon *combined* elements of physical listening (such as leaning away from the speaker, rubbing hands together, arm crossing, and touching one’s own face) rather than one single behavior (such as crossing one’s arms). Robots also found that the interpretation of physical cues is context dependent. What seems welcoming at a picnic might not seem comfortable in the dental operator. Interpretation is also rapport dependent. You can relax a little after good rapport has been established.

Restatement and Paraphrasing

These two techniques are the ones that are most often lampooned, but it doesn’t take much practice to learn how to use them skillfully and to powerful effect. The important paradox is that in order to restate, one must fully attend to what the speaker says and means. This blocks the listener from rehearsing his or her next (magnificent) statements. You can’t rehearse your own speech when you have to listen closely, nor can you let your mind drift. That alone makes restatement worth doing, even when performed inelegantly. The intention to restate blocks premature reassurances, such as “Don’t worry,” or “It’ll be OK,” or “We can take care of that.” Just as important, it also prevents premature problem-solving, another well-intentioned behavior that can seem dismissive to the speaker. Dentists—like the stereotyped male—can respond to a request for support by jumping to the conclusion that there is a practical problem to be solved. They “get right on it,” missing the essential message entirely. Or, instead of staying

with the speaker's message and concern, they begin to offer all kinds of "helpful" suggestions, most of which have already been considered and rejected by the patient. It can be insulting to mention a concern, only to be met with suggestions that you've already discarded. *Why isn't he listening? He must think I'm not very smart or capable.*

Restatement means that you simply repeat what the speaker said and wait for confirmation that you got it right. While you don't want to just parrot what was said, it's usually effective to voice what you heard and see if it's correct. You can start with the simple word "So . . ." and follow it with a restatement of what you understand. Or "It sounds like . . ." or even the very basic:

Let me make sure that I've got this right. You think that it's really not worth putting a crown on this tooth because you are going to lose that tooth someday, anyway, and it doesn't make sense to spend the money.

After restatement, wait to see if you got it right. Let the speaker confirm or correct your response. If they correct it, make the correction and do it again until they let you know that you got it right.

OK. So, it's not that you are concerned about the money. You don't like dental appointments and really don't want to have to put yourself through the procedure if it is not going to last.

Speaker: "That's right."

It may surprise you to find that speakers generally experience this kind of interaction as deeply respectful, and they appreciate your efforts to understand them accurately. Avoid the phrase "What I hear you saying is . . ." because it has been used so often to parody restatement and active listening. That phrase has become a joke.

Paraphrasing is similar to restatement, except that you report what your patient said in a way

that focuses on an aspect that needs more exploration.

From what you said, it sounds like you really have second thoughts about getting an implant.

Obviously, the process of paraphrasing requires an active listening process. You have to be tuned in to do it accurately.

Finally, you don't want to restate a fact or a question that deserves a factual answer. For example:

Speaker: "Could you tell me what time it is, please?"

Listener: "Sounds like you are concerned about the time."

Summarizing

This procedure is similar to paraphrasing, but more extensive. The listener combines several speaker comments along with relevant history and context to make a statement that ties them all together in a coherent way.

All right. So, on the one hand, you would like to have an implant if you can afford it, but at the same time, you are worried that the procedure might be painful or uncomfortable. Plus, your wife thinks that an implant will look a lot better than a crown, so you feel a little pressure from her. Do I understand you correctly?

Once again, you patiently wait for a response from the speaker. If they correct what you said, all the better. Welcome this correction and make it.

Reflection of Feelings

While listening, notice how people present their message, combine this observation with the situation and context along with your prior knowledge of the patient, and guess at what they might be feeling. Feelings include core emotional responses such as anger, sadness, hurt, fear, and joy, as well as hundreds of more nuanced reac-

tions such as embarrassment, frustration, pride, shame, envy, surprise, and disgust. Using discretion, reflect this feeling back to them.

"You sound like you might be a little anxious about our appointment next week."

"You sound pretty frustrated."

"Sounds like you might be disappointed or even a little annoyed about this."

This kind of reflection can be powerful and helpful, especially when feelings run high—when patients are frightened or angry. But, it is far better to reflect a *feeling* to an angry person than to tell him to "Calm down" or to respond to angry assertions by refuting them.

Listening for feeling takes some practice, but, once again, it moves the listener away from attention to self toward attention to others, and that's generally a good thing. It tends to be an interesting task, difficult at first, easier with practice, and never foolproof. Do not assume that you know what another person is feeling. You must check, and others are usually appreciative when you do. It shows that you care about them.

What to Do

We speak with more than our mouths. We listen with more than our ears.

—(Mister) Fred Rogers (2005, p. 79)

First, decide who you are as a dentist. Choose your identity. Are you a restorative technician or a doctor? Are you a sales person or a healer? Is it your goal in life to achieve a high rate of "treatment plan acceptance" or do you have more important professional goals? The answer to these questions will determine your stance on listening.

Second, make a commitment to self-improvement. Decide that the time and effort that it takes to be an excellent listener is worth it. Put yourself on a lifelong program. Solicit

frank feedback from others about your own listening behavior (you may be surprised!). Study listening, watch other people, and evaluate the things that make them good or poor listeners. Pay careful attention to the best listeners you know. Figure out how they do it. Read some of the books at the end of this chapter. Remind yourself about listening. Wear a colored wrist band if necessary. Put a sign on the wall. Recruit team members to remind you and give you strokes when you've done well.

Examine your attitude. Figure out how self-centered or even narcissistic you are. Decide whether you want to be more interested in other people and what they think and feel. Become more quiet. Listen more than you talk. Stop trying to change or influence people without their permission or specific request. (People generally dislike unsolicited advice.) Stop competing in conversations. Don't draw attention to yourself. Pay attention to others. You already know how *you* think. Figure out how others think. Commit to the "listening attitude."

Put your dental practice on a plan to enhance listening and communication, with patients and with each other. Conduct a group evaluation (give everyone a chance to contribute an opinion) of the listening culture. Hire a consultant from time to time to help out. You needn't hire an expensive corporate-type consultant, as most mainstream psychologists in your neighborhood have the skills to do this. The process can be fun and extremely helpful. It can make your practice environment a nicer, richer, more comfortable, more productive place. Patients will benefit, too. (Note: The author makes no claim to be an excellent listener; he is at best a traveler on the path. He seems to be getting better.)

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19

Interpersonal Communication Training in Dental Education

Toshiko Yoshida and Kazuhiko Fujisaki

Key points

- The five main factors that influence the development of communication training are (1) the learner's level, needs, and readiness; (2) the goal setting for the program; (3) the use of appropriate teaching methods encouraging active learning; (4) the availability of quality resources; and (5) the evaluation of the performance of the students.
- Role-playing with peers and role-playing with non-computer-simulated patients (SPs) are two major teaching methods to encourage active learning.
- A successful training program using SPs needs to ensure that the SPs are trained to guarantee quality performance, that robust cases are developed, and that the facilitators are trained for their roles.
- Assessment methods based on the program's learning objectives should be used to evaluate communication training programs.

Good communication is a window for understanding patients, and serves as a base for providing better patient care. When patients are interviewed in a way that makes them feel understood, their problems and concerns are alleviated. If dental health professionals can clearly comprehend a patient's problems and concerns, they become more capable of responding to that patient's needs. As a result, an accurate diagnosis and an appropriate treatment plan can be achieved. It is therefore important for dental health professionals to gain and use effective interpersonal communication skills. In this chapter, we refer to the development, implementation, and evaluation of successful training programs, particularly those focusing on using simulated patients.

The Benefits of Good Communication between Providers and Patients in Dental Care

Effective interpersonal communication plays an important role in dental care and has positive effects on outcomes. Existing literature suggests that effective dentist–patient communication increases patient satisfaction and compliance, and reduces patient anxiety and the risk of malpractice claims. Imanaka et al. (2007) identified that communication with the dentist was the most important factor for patient satisfaction in a university hospital. A recent study indicated that dentists giving personal attention when listening to a patient's complaint, and helping the patient and instilling confidence about the treatment, were among the important factors related to perceived patient satisfaction (Dewi, Sudjana, & Oesman, 2011). Sondell, Söderfeldt, and Palmqvist (2002) reported that giving patients the opportunity to talk about their dental health helped improve patient satisfaction with the treatment outcome. Effective communication increases patient satisfaction and tends eventually to impact on patients' cooperation

and compliance. Sinha, Nanda, and McNeil (1996) found that politeness was one of the important predictive factors for patient satisfaction as well as for patient compliance, such as keeping appointments and wearing and maintaining appliances. Establishing sympathy and informal relationships between the dentist and the patient contributes to attendance at follow-up sessions (Sandell, Camner, & Sarhed, 1994).

As well, how to communicate with patients is related to a reduction in dental fear/anxiety and the risk of malpractice complaints. A decrease in negative beliefs in how dentists communicate, for example, how uncomfortable patients were asking the dentist questions and how dentists dismissed patients' worries, was one of the predictors of successful treatment for dental-fear patients (Abrahamsson et al., 2003). Bernson et al. (2011), in a qualitative study, analyzed interviews with patients with dental fear and concluded that in trusting interactions with dental staff, communication reflecting respect, attention, and empathy were among the core factors making regular dental care possible. Lopez-Nicolas et al. (2007) analyzed dental malpractice cases and observed that frequently there was insufficient, or an absence of, information provided during the course of such cases. They pointed out that there was a need for dentists to develop communication skills along to complement their clinical skills.

As is evident from the literature, good communication, along with the quality of dental technology procedures, is an important factor in the process of dental care. However, patients seemed to be less satisfied with particular aspects of the dentist's communication, specifically the dentist's explanations related to the treatment (Al-Mudaf et al., 2003; Dewi et al., 2011). Compared with other doctor–patient encounters, dental consultations allow practitioners a better chance to observe and directly palpate disease sites before any subsequent surgical treatment. As a result, dental practitioners tend to rely less on a patient's subjective complaints and may not put a strong enough emphasis on their communication with patients

compared with relying on their technical skills. Verbal communication with a patient can often be too limited during the dental treatment process. Because of the nature of dental treatment services, there is a need for dental health professionals to have more effective communication skills.

Interpersonal Communication Training in Education

Teaching patient–doctor (dentist) communication, both in medicine and dentistry, has traditionally been incorporated into clinical rounds, where excellent opportunities exist for students to simultaneously learn both communication and clinical skills. Nevertheless, students appear less likely to have their patient interviews monitored and to receive the benefit of feedback from busy faculty. Haak et al. (2008), in a randomized study, compared two groups of students: a study group of students who attended a clinical course as well as a communications course, and a control group of students who attended a clinical course as well as problem-based tutorials. The results demonstrated that unlike the study group, the control group did not improve their communications competence. Both groups spent the same amount of contact time with patients in their clinical course. This study suggested that the mere repetition of task skills, without also receiving appropriate guidance or feedback, did not guarantee improvement.

Fortunately, in recent years, educators and practitioners have begun to realize the importance of interpersonal communicative competence for healthcare providers. A recent survey revealed that dentists, as well as dental students and patients, perceived that communication is a vital aspect of competence in dentistry and supported the inclusion of communication training in dental education (Woelber et al., 2012). Yoshida, Milgrom, and Coldwell (2002) found that the most frequently used educational method was lectures. However, more

recent research evaluating communication skills learning or assessment methods in undergraduate dental education found clinical role-playing using simulated/standardized patients (SPs) was being widely adopted in addition to didactic learning. This implies the increased use of more active learning methods (Carey, Madill, & Manogue, 2010).

Factors Influencing the Design of Interpersonal Communication Training

The effect of communication training depends on its quality. A number of factors influence the development of communication training:

1. Learners' levels (novice to expert) and their needs and readiness affect the design of a training program, which can range from basic to advanced.
2. Goal setting is critical for quality interpersonal communication training to be effective in clinical situations. The training needs to be designed to improve the trainee's knowledge, attitudes, and skills. Successful training should help the trainee expand their knowledge as well as integrating that knowledge into problem solving to effectively perform tasks. Specific training goals affect the design of the training program. Thus, goals need to be determined and adjusted for a student's training level and individual proficiency.
3. The specific goal of a given training session will determine the appropriate teaching method. Passive instruction, such as a lecture, is suitable for information transmission, while performance-based methods need to be included if the goal is to improve personal attitudes and behavior.
4. Resources, including computer technology and audiovisual aids such as computer-based simulations and videotapes, can be powerful training tools for problem-based learning. A small room with a one-way mirror helps

a trainee to be less apprehensive about being observed, and also enables them to concentrate on performing the simulated task. Manuscripts for case studies and books/handouts for lectures are also invaluable resources for communication training. For appropriate staffing, cooperation from facilitators with behavioral science/communication backgrounds and specific health professionals is recommended (Dickson, Hargie, & Morrow, 1997). While a sufficient number of staff is desirable, for live-patient simulations, the availability of simulated patients is a critical factor.

5. Evaluation of performance, as Dickson et al. (1997) noted, is essential. What needs to be measured as well as how to measure it must be considered. What needs to be measured is linked to learning objectives. If the trainees are expected to improve mainly cognitive aspects, pencil-and-paper type evaluations, such as quizzes, essays, and questionnaires are applicable. Trainees' problem-solving abilities can be assessed by a written examination requiring an analysis of a videotaped interview or printed dialog, with written responses related to the specific case being considered. However, what trainees *think* they should do is not necessarily the same as how they actually behave. Therefore, a preference exists for performance-based examinations when the goal is to acquire skills and to improve interpersonal behaviors.

Performance-Based Methodologies: Role Playing and Live-Patient Simulation

Popular teaching methods in active learning appear to be role playing with peers, and role playing with non-computer-simulated patients. There has been a gradual increase in studies investigating the effectiveness of teaching methods, with one study attempting to compare the effectiveness of role-play with the use of SPs (Lane & Rollnick, 2007; Schlegel et al., 2012).

Each method has its strengths and weaknesses. Some trainees find role-playing in a simulation difficult, especially when they role-play with colleagues (Lane & Rollnick, 2007). Sometimes they are embarrassed because they consider it artificial and are afraid of exposing their incompetence to others. However, a compensatory benefit of this method is that it encourages the trainees to be critical of their own performance and exposes them to such experiences in a safe environment. Role-playing exercises are particularly valuable as they allow performers to understand a patient's perspective by putting them in the patient's position. Besides, if feedback from another person is available, performers will realize and identify their personal shortcomings, enabling them to adjust their behavior to meet the needs at hand. These experiences may prove more appealing to students than a simple lecture.

Although there appear to be a greater number of studies regarding medical education, communication education and training programs using a *non-computer-simulated/SP* in dentistry have been increasing along with evaluation studies of such programs (Cannick et al., 2007; Wagner et al., 2007; White, Krüger, & Snyman, 2008). Ever since SPs were selected for use for an objective structured clinical examination (OSCE), the SP simulation methodology has gained unexpected and considerable attention. SP appears to be an influential educational tool.

Background History of the SP as a Tool in Medical and Dental Education

An SP is a layperson trained to portray the medical history as well as the psychological and social background of an actual patient. An SP is often distinguished from a simulated patient; the difference between them being whether the acting of the role is standardized or not. An SP is usually used for assessment and is expected to give consistent responses to a trainee's reactions. Both verbal and behavioral responses are strictly controlled. On the other hand, the *manner* in which a simulated patient provides

information depends on the situation of the encounter between the patient and the trainee.

The first reported use of a "simulated patient" was by Barrows and Abrahamson (1964), and this was a popular method throughout the 1970s in the United States. However, it was used mainly for demonstration purposes, with a few institutions using SPs for assessment purposes. In the 1980s, the benefits of assessing clinical competence of doctors and medical students using the SP methodology were widely recognized, along with objective assessment methods such as the OSCE (Harden & Gleeson, 1979) with its primary focus on assessment (Coggan, Knight, & Davis, 1980; Stillman et al., 1986). In 2004, an OSCE was established as a United States Medical Licensing Examination, and SP became an essential part of medical education. The first use of SPs in dentistry, however, was not until 1990 (Johnson, Kopp, & Williams, 1990). It was later introduced into teaching (Stilwell & Reisine, 1992). Although there was gradually increasing interest in this type of method, teaching communication skills using the SP method was less popular in dental education than it was in medical education.

In Japan, SPs first appeared in dental education to teach interview and communication skills about 10 years later than in the United States (Mataki et al., 1998). Later, SPs were used in OSCEs for assessment of communication skills for medical interviewing (Ogawa, Taguchi, & Sasahara, 2003). Increasing patient demands for dentists to have communication competence and increased risks of malpractice forced dental professionals to apply a new educational methodology.

What Is the Benefit of the SP Methodology?

As Barrows (1993) stated, SPs have some advantages over real patients. They can be used anywhere and anytime, unlike real patients whose presence is limited and difficult to control. Similarly, they can be used repeatedly and in the same setting. The situations and conditions for

a simulation can also be adjusted to specific educational purposes; for example, discussion concerning the patient is possible immediately after the simulation or even in the middle of the simulation. Furthermore, the difficulty of the encounter can be adjusted to the learner's level of proficiency. SPs can also create an environment where learners can practice role-playing without any anxiety about harming real patients. Moreover, they can allow learners to experience various clinical procedures in one setting, (e.g., from initial interview until postoperative instruction) and allow them to focus on the patient's problem. These procedures take days in real practice. As well, an SP can provide feedback.

An essential feature of the SP method is that it can be adapted for repeated presentations in trainings where there is a high risk of mistakes occurring. Discussion immediately following the simulation helps to identify any troublesome problems. Feedback from the SP as a recipient of medical services is a very important part of this practice, unlike role-playing that occurs only with medical peers.

Several significant factors are helpful for understanding the dynamics of a layperson's participation in the role of the SP (Fujisaki, 2002). Most importantly, the participation of a layperson greatly improves a student's attitude toward studying, since unlike lecturers with familiar faces, SPs are ordinary people who rarely come into a classroom. This fosters greater attentiveness and challenges students to behave politely toward members of society who might not always willingly comply with the dentist's instruction. The students' learning is therefore more realistic and effective. Voluntary participation of citizens in medical education setting allows students to appreciate society's expectations of them, and for them to realize the social responsibility of meeting those expectations. Such expectations are hardly stressful, but rather serve as a strong motivation for studying. Furthermore, the feedback from the nonprofessional volunteer SP can be appreciated because it comes from a communication partner and is

heard as the voice of the service recipient. It is feedback given to the entire medical community.

Some Essential Factors to Achieve a Successful Training Program

Training SPs and Quality Assurance

SPs need to be trained to have the skills needed to perform as effective human resources in education. However, Adamo (2003) pointed out that in medical education in the United States, there is no standard for an SP's qualification and that each group (sometimes affiliated with hospitals and universities) has its own training standards. Cantillon et al. (2010) confirmed a similar situation regarding SP use in Europe. Reviews have suggested that studies utilizing SPs rarely provide details of the training undertaken for SPs (Watson, Norris, & Granas, 2006; Howley et al., 2008).

An SP has two main functions: one is playing a role, the other is giving verbal or written feedback for assessment or teaching. Playing a role is, in itself, not necessarily difficult, although acting ability or experience may be helpful since SPs are often expected to provide impromptu reactions during training sessions. The demonstration of specific physical symptoms in a role does require prior training, if only by observing real patients and receiving guidance from health professionals. To preserve the realism of the simulation, SPs should be well-informed to be able to respond to medical questions from trainees on specific symptoms. Since an interview can involve several different aspects, preparation for unexpected questions is necessary. Particularly when SPs are used for evaluation purposes, such as in an OSCE, more elaborate guidance and training are required to ensure that SPs can give consistent answers to trainees' questions.

When providing feedback, an SP must step out of their acting mode and recall how they felt

during the encounter, and what gave rise to their feelings; for example, "I was willing to share my feelings because you didn't criticize me" or "I couldn't fully understand what you explained to me, because you talked too fast." By mentioning the specific behavior or attitude that caused such feelings (e.g., the content of conversation, gestures, facial expressions, and other nonverbal signs), trainees can learn to revise or retain their approach for similar encounters in the future. Therefore, SPs need to have the ability to observe a trainee's performance and recall details of the interactions. Feedback must always be concise and without excessive detail, and be sensitive to the trainee's readiness. If trainees suspect that the expectations are much higher than their current level of proficiency allows, they will soon give up trying to modify their behavior. Moreover, SPs need to give constructive and objective feedback. If SPs remain in the acting role and give unrestrained negative emotions in the guise of a patient, it may offend trainees' feelings and build resistance to any behavior changes. Wallace (2007) recommended seven principles for training SPs to give written feedback: (1) have SPs give feedback from the perspective of the patient; (2) encourage SPs to give their perceptions using the patient's pseudonym of the case; (3) make sure that SPs do not give feedback on the medical issues of the case; (4) make sure that SPs have at least one key response to use; (5) use the "Club Sandwich" positive-negative-positive technique in the feedback; (6) encourage SPs to discuss learner's specific behavior, not attitudes and personalities that cannot be changed; and (7) let the learners know what they could have done differently. This guidance also applies to giving verbal feedback.

Qualifications for volunteering as an SP are to be willing to help and to bear no antagonism toward health providers. If SPs delivered inappropriate feedback because of a negative bias toward health providers, that would do more harm than good. Because an SP's feedback can have such a great impact on learners, it has to be carefully delivered so as not to be demotivating.

An important point is that the feedback from an SP should be voiced from a patient's perspective. When SPs become very familiar with clinical skills, they might then play a preceptor's role (Adamo, 2003). It is important for an SP to identify with the patient's predicament since one of the training objectives is for the student to understand the patient's concerns, something that is sometimes difficult to achieve in a busy dental schedule in an actual clinical setting.

The most frequently observed background of SPs in the United States is acting (Abe et al., 2011), while most SPs in Japan are ordinary people from local communities. Some hospitals have lists of volunteers; a survey revealed that about 135 such groups exist in Japan, with 1200–1400 simulated patients, and the number is growing (Fujisaki, 2010). The standards for qualification and training as an SP have not been clearly set out in Japan, with similar situations in the United States and Europe.

Case Development

A case scenario should embody the objectives that the trainees are expected to learn with the objectives matched with a particular role. If the objective is for the trainees to learn how to listen to and deal with a patient's concerns, the SP's behavior should reflect a certain concern or problem. For example, the SP might voice a fear of anesthesia because of a previous bad experience, and a concern about infection. For this type of objective, the training should focus on acquiring active listening skills, such as responding to the patient's concerns. Unless a case scenario has clear objectives, the trainee's learning experience may become confused and the effectiveness of the training reduced. The case scenario should also describe the background information about the SP, including lifestyle, occupation, family members, and attitude/habits toward dental/medical health. Such information could be adjusted to match the actual characteristics of the SP, making it easier to play the role. This is especially important for nonactor SPs.

Faculty (Facilitator) Development and Quality Assurance

A facilitator is expected to establish the environment where all participants, including SPs, trainees, and observers can freely and openly discuss the training session. The facilitator might indicate some important aspects that an SP failed to mention in their feedback, as well as reinforce the SP's feedback by emphasizing its quality. If there are some points remaining to be learned that did not arise in the simulation, the facilitator needs to review them. It is also important to note whether the feedback is applicable to dentist–patient communication in general, or to a personal view of a certain type of patient. Trainees sometimes regard feedback from an SP as applicable to any patient, and so might easily conclude that “all patients feel this way” or “this will work with any patient.” Appropriate behavior depends on differentiating among patient characteristics, background, and needs. The facilitator should also be able to point out any discrepancies between a trainee's intention in executing a certain behavior and an SP's perception of what was delivered.

Since a case scenario is closely linked to learning objectives, the facilitator is often involved in designing the curriculum, including case development. The facilitator is sometimes expected to not only train and monitor the SP performance, but also to coordinate SP rotations when a shortage exists. Nevertheless, since faculty development in Japan is still evolving, some SPs may be asked to take the facilitator's place in the training; this poses the question of clearly defining the SP's role in the training. More serious perhaps is that the faculty often completely depends on the SP for implementing training, including case development, because of their own poor ability to serve as the facilitator.

One of the current challenges in conducting SP simulations in training is that there is a need to train both SPs and facilitators. To address this serious problem, workshops on training implementation for medical and dental faculties have

been held in Japan, but there remains a shortage of skilled facilitators and SPs. Development of such skills in educational institution faculties is an immediate priority.

Evaluation of Interpersonal Communication Training

To assess trainees' cognitive changes, it is useful to obtain feedback from them about the impact of a training, such as what they found useful and what they learned. A good example of evaluating behavioral changes is the medical interview situation that utilizes SPs in an OSCE. An OSCE can control the conditions, that is, the level of difficulty and the responses of patients, but it can evaluate only some of the trainee's skills. On the other hand, direct observation of trainee communication with real patients in a clinical setting is a superb method to evaluate a trainee's overall competence. The disadvantage of this method rests in the difficulty of standardizing conditions, which is not the case with an OSCE. It is therefore desirable to use both methods. A more appealing solution is to measure health outcomes such as patient satisfaction and adherence to health services and practice as proof of training effectiveness. This allows assessment of whether trainees' behavioral changes would actually be effective for approaches to real patients or not, and this can be proof of a more patient-oriented assessment.

The use of 360-degree assessments has also attracted considerable attention. The 360-degree approach has been used for the management of executive performance in industry and has been applied to healthcare education. This approach is a measurement tool completed by multiple people who have had the opportunity to observe a trainee's performance. Evaluators include allied clinical as well as office staff, colleagues, faculty members, and patients. This approach appears to be effective in obtaining a comprehensive view of a trainee's interpersonal communication skills, in contrast to the traditional

evaluation that is made only by faculty (Meng, Metro, & Patel, 2009; Tumerman & Carison, 2012). Evaluation of communication training needs to be carried out to measure how much trainees have learned as a summative assessment, and also to give trainees feedback as a formative assessment. At the same time, evaluations provide evidence for the assumption that communication skills can be learned.

It is now widely recognized that interpersonal communicative competence for health-care providers is important. This chapter has attempted to discuss the development, implementation, and evaluation of successful communication skills training programs. A successful interpersonal training program needs to ensure that these three stages should be achieved properly.

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20

Biopsychosocial Considerations in Geriatric Dentistry

Georgia Dounis and David Cappelli

Key points

- Biologically advanced age modulates neuroendocrine and immunologic pathways at the cellular and molecular level over the course of life.
- Oral disease is, by and large, a chronic inflammatory process that affects the systemic health.
- Oral-systemic conditions are influenced by psychosocial influences.
- Behavioral risk factors modulated by psychosocial dynamics have adverse effects on specific physiological determinants of health.
- Chronic disease prevention requires interprofessional risk assessment and intervention.

Introduction

Shifts in global demographics' increased life expectancies are a well-documented phenomenon and are humanity's most astonishing biomedical and psychosocial triumphs. These phenomena are directly related to biomedical

advances that improve overall health as well as societal/behavioral changes that include a healthier diet, greater social engagement, and increased level of physical activity. The elderly (65+ years old) are involved in volunteerism, travel, educational pursuits, and are a reservoir of experienced workforce. The increase in the

proportion of the elderly in the overall population will impact the socioeconomic fabric of society and influence international political agendas. Asia, Latin America, and the Caribbean are projected to experience a dramatic growth in the number of elderly, whereas, Europe, China, and India are expected to experience a population growth of octogenarians (80+ years old) (HelpAge International, 2010; Global Health and Aging, n.d.).

Similarly, the United States is experiencing a shift in demographics as the baby boomers turn 65 years of age and the number of the elderly is projected to triple to almost 90 million by 2060. The elderly over the age of 80 years are expected to double, representing over 20% of the population by 2030. Environmental, lifestyle, behavioral improvements, socioeconomic prosperity, genetic endowment, and efficient therapeutic regimens have extended life expectancy (Murphy & Hepworth, 1996; Cutler, Glaeser, & Rosen, 2007). Yet, the majority of Medicare recipients are diagnosed with one or more noncommunicable lifestyle-related chronic systemic (Table 20.1) condition with associated comorbidities that affect their quality of life, loss of autonomy, and increased healthcare costs (Kass-Bartelmes & Bosco, 2002; Keehan et al., 2012). Modern technological advancements and polypharmaceutical interventions have transformed once fatal diseases into chronic conditions expressed later in life that exacerbate oral

manifestations (Ciancio, 2004; Cherry, Lucas, & Decker, 2010).

While some elders are facing longer and more active lives, some elders experience functional decline, often inevitable with onset of chronic conditions, affecting activities of daily living (ADL), such as eating, bathing, and dressing, and instrumental activities of daily living (IADL), such as grocery shopping, preparing meals, and taking medication, which further increase the risks of isolation, depression, and suicide (National Institute of Mental Health, 2003). The elderly are also challenged by geriatric syndromes, which are a unique interaction of pathogenic pathways, multifactorial etiologies that develop as an atypical single clinical symptom (i.e., delirium, frailty, incontinence), and does not fit traditional disease system categories (Walston et al., 2006). The synergistic effect of advanced age, cognitive, functional decline, and psychosocial risk factors challenge the elderly and caregivers, and increase the degree of stress exerted on the healthcare system (Evarard et al., 2000; Inouye et al., 2007). Chronic conditions presented by the elderly involve multiorgan systems that cross discipline-based boundaries. Healthcare management requires coordinated patient-directed interprofessional care.

Most chronic systemic conditions and oral disease share common lifestyle modifiable risk factors mediated by genetic, environmental,

Table 20.1 Noncommunicable Lifestyle Chronic Conditions

Chronic condition	Prevalence of chronic condition (%) over 65	Healthcare cost to manage	Risk of disease
Diabetes	20%	\$177 billion annually	Diet, physical inactivity, stress
All type of heart disease	32%	\$172 billion annually	Diet, stress, physical inactivity, smoking, alcohol, hygiene
Alzheimer's disease	13%	\$200 billion annually	Stress, smoking, alcohol
Dental disease	95%	\$102 billion annually	Diet, smoking, alcohol, hygiene, stress
Periodontal disease			
Dental caries			
Osteoarthritis	50%	\$128 billion annually	Physical inactivity, stress
Cancer	22%	\$227 billion annually	Smoking, alcohol, stress

behavioral, and socioeconomic factors (Department of Health and Human Services [DHHS], 2000; Paquette, 2002; Seymour et al., 2007; Oral Health America, 2003). Oral health is one domain of health that can affect general health, including emotional, psychosocial, and functional well-being (Ciancio, 2004; Kandelman, Petersen, & Ueda, 2008; Department of Health and Human Services [DHHS], 2000). The oral cavity is a well-balanced ecosystem that harbors diverse bacterial species in high-density biofilm. Lifestyle habits, environmental disparities, as well as host response to bacterial accumulation on the hard and soft oral tissues may contribute to an inflammatory response not directly associated with chronological age (Fitzgerald, 1968; Keyes, 1968). Ninety-eight percent of the population is challenged by diseases of the oral cavity (Bomberg & Ernst, 1986). Traditional medical care promotes crisis intervention and does not generally cater to the heterogeneity of oral-systemic diseases in the elderly. Consequently, the acute management of chronic oral-systemic conditions presented is below an acceptable standard of care (Elderton, 1990; Oral Health America, 2003; Asch et al., 2004; Tinetti, 2004; Higashi et al., 2005; Reed et al., 2006). Postretirement/vulnerable populations also encounter environmental barriers that limit access to oral healthcare services with emergency room as the only viable option to access dental services (Martin et al., 2011).

Regardless of images and stereotypes of debilitation, frailty, and dependence, the majority (65%) of the elderly, are independent, healthy, active, and productive members of society (Flood, 2002; National Center for Health Statistics, 2006a,b; Federal Interagency Forum on Aging Related Statistics, 2010; Older Americans, 2012). Advanced chronological age measures of the passage of time is not indicative of social, biological, or functional decline that increases the risk for disease and death (Gelberg, Andersen, & Leake, 2000; Crews, 2007). An individual sense of purpose in life, ability to effectively cope to cumulative physiologic and functional alterations associated with the

passage of time while in harmony with spiritual connection results in successful aging (Flood, 2002; Roberts et al., 2006). Lifestyle practices are emphasized as a key risk factor of chronic disease progression, and positive lifestyle behaviors can reduce the stereotypical limitations of aging (Rowe & Kahn, 1997).

The goal of healthcare providers in treating the elderly is to improve function, maintain independence, and promote quality of life. The purpose of this chapter is to highlight the biopsychosocial challenges of the elderly in managing their oral healthcare needs and guide healthcare clinicians to integrate risk reduction and disease prevention in the health care of the elderly.

Biological, Physiological, and Systemic Determinants of Aging

The process of biologically normal aging affects the body systems at all levels. This process is described as a complex, malleable multidimensional process illustrated as a slow lifelong accumulation of cellular and molecular responses (wear/tear) to injury that produce low-grade chronic inflammation that may lead to organ/system decline, frailty, disease, and disability (Crews, 2007; Finch, 2007; Kirkwood, 2008). The process of aging occurs at different rates in different tissues dependent on environmental stressors, lifestyle habits, genetics, physiologic reserves, and biological resilience that influence health, severity of cellular and molecular damage that result in disease over the course of life (Partridge & Gems, 2002; Kirkwood & Austad, 2000). Acute levels of inflammatory proteins are beneficial early in life; physiologically negative effects on the body are neutralized by molecular, cellular, systemic, and individual mechanisms (adaption/remodeling capacity) that contribute to the survival, aging, and longevity of individuals (Barker, 1995). These markers of inflammation associated with aging have also been linked to oral health outcomes (Arola & Reprogel, 2005).

The role of inflammation in aging is equally critical for healthy dental aging.

Data suggest that over the course of life, unfavorable early life events occur, such as DNA damage (intrauterine DNA methylation patterns, damaged DNA repair mechanisms), biopsychosocial and environmental stress-related events increase inflammatory load (causing disruption of homeostasis), increase cellular death rate, and deplete biological/physiological reserves that increase susceptibility to cardiovascular disease, metabolic syndromes, and postnatal infections (Iachine et al., 1998; Seeman et al., 2001; Boulet et al., 2006; Schoenmaker et al., 2006; Borghol et al., 2011; Kirkwood, 2011; Brant, Deindl, & Hank, 2012). These events play a pivotal role in the aging process.

Age-related subclinical structural/functional connective tissue (loss of elasticity, reduced keratin, and collagen) changes will accelerate blood vessels, airway passage, and organ rigidity with gradual decline in vital organ function (Seeman et al., 2001). Organ reserves also decline with advancing age primarily seen in heart, lungs, and kidneys. Daily psychosocial and environmental stressors will increase allostatic load combined with gradual decline in organ function that will lead to organ failure. Other synergistic effect of chronic stressors, toxins, and intrinsic cellular response mechanisms will contribute to tissue injury and trigger the onset of host repair mechanisms that lead to an increase in the collagen network deposits that develop in focal fibrotic scars, routinely noted clinically in blood vessels. In the brain, subclinical accumulation of plaques and tangles are observed as part of the normal aging process that will slow neurotransmission prior to expression of disease. Other age-related system changes include gradual decline in rate of metabolism clinically seen as increased and redistribution of body fat toward the abdominal area. Gradual decline in muscular tissue mass will compromise gait and balance.

Clinically elevated systolic and diastolic blood pressure, waist to hip ratio (metabolism

and adipose deposit), glucocorticoid activity (HDL), urinary cortisol, urinary epinephrine, and norepinephrine are measures of organ system changes that are a result of increase in allostatic load (Seeman et al., 2001). Allostatic measures related to physical function (ADL/IADL) have often been used to assess the individual's ability to cope and adapt to daily task performance (Fried et al., 2005). Anger, anxiety, and depression, are psychological factors that increase allostatic load, promote stress-related disorders, compromise function, and promote disability.

Neuroendocrine Response

Synergistic age-related structural and functional (immunosenescence) changes in the immune system can occur in combination with chronic psychosocial environmental stressful (depression, irregular sleep patterns) events. In negative situations, immune system dysregulation will increase the risk of compromised wound healing, infection, neoplasm, autoimmune disease, and oral disease. Physiologically activated neuroendocrine response pathways modulate expansion of inflammatory toxins from reaching vital organs to cause loss of function (Hermann, Beck, & Sheridan, 1995). Physiologic characteristics of the normal aging process results in elevated levels of proinflammatory mediators (C-reactive protein [CRP], interleukin [IL]-6, and tumor necrosis factor [TNF]) that stimulate the neuroendocrine system and are associated with chronic disease (Franceschi et al., 2000; Ridker & Cook, 2004; Schaap et al., 2009). Chronic high levels of IL-6 are a potent predictor of human demise.

Psychosocial stresses/environmental toxins will trigger biochemical hypothalamic-pituitary adrenal (HPA) axis by proinflammatory cytokines to increase cortisol secretion that is implicated in multiple chronic disorders ranging from psychiatric disease to somatic complaints (American Geriatrics Society, 2002; Kudielka, Hellhammer, & Wust, 2009). Age-related HPA decline will result in reduced hormone secre-

tion and dysregulation of the immune response to stressful events (Seeman et al., 1994). Long-term individual psychosocial stressful events (caregiver for spouse with dementia, low socioeconomic status [SES]) will cause overload HPA and increase susceptibility to infectious diseases, contribute to immunosenescence, frailty, and disease. A blunted HPA response to chronic stress will promote autoimmune inflammatory disease.

Systemic Disease

Chronic levels of stress will weaken the blood-brain barrier, elevate sympathetic system stimulation, as well as increase circulating levels of cortisol. Chronic low level of inflammation has been identified as essential in initiation, progression, and disease complication (Libby, Ridker, & Maseri, 2002; Pai et al., 2004). Development of atherosclerosis is associated with increase in sympathetic system activity that includes increased insulin resistance and hemodynamic arterial wall changes that increase risk for cardiovascular events (Ross, 1999; Lu & Jin, 2010). Other changes include increased hyperglycemia, increased production of gastric acid secretion, inhibited excretion of sodium, accelerated potassium excretion, and a weakened immune system. Disease expression will vary by individual personality, emotion, and cultural, social environmental support systems. Anger, urbanization, and high job demands, have been shown to increase risk for hypertension and possibly impair ventricular function. Individual habitual intake of high-sodium diet and chronic levels of stress will increase cardiac output in early age expressed as hypertension and decreased cardiac output with advanced age due to peripheral vascular loss of elasticity, and left ventricular hypertrophy (Falk, Shah, & Fuster, 1995; Davi & Patrono, 2007).

Healthy aging is a universal aspiration that requires a healthy mind to maintain general autonomy, the ability to process information, and adaption to environmental changes. The most important aspect of aging that concerns

the elderly is the ability to maintain a healthy mind (Vance & Crowe, 2006; Inelmen et al., 2007). However, mental health issues and cognitive limitations are more prevalent in the elderly population, most notably, an increased prevalence of dementia. The inability to perform ADL/IADL and maintain oral hygiene practices is a predictor of depression, cognitive decline, life dissatisfaction, loss of autonomy, and mortality (Chalmers & Pearson, 2005; Royall et al., 2005; McGuire, Ford, & Ajani, 2006; Meurman & Hamalainen, 2006; McGrath, Zhang, & Lo, 2009). One study reported that tooth loss prior to 35 years of age significantly increase risk of developing Alzheimer's disease (Gatz et al., 2006), while another study found elderly psychiatric adults have a higher prevalence of edentulism, poorer oral hygiene, and a higher score of dental caries experience (Lewis, Jagger, & Treasure, 2001). Other studies have shown a 2.6-fold increase in risk of Alzheimer's when over half of natural tooth loss occurred prior to 50 years of age. In this study, the onset of periodontal disease was observed 20–30 years prior to expression of dementia (Stein et al., 2007). Elevated levels of apolipoprotein (APOE) ϵ 4 allele are more prevalent in edentulous elderly and are related to increased risk of dementia and vascular disease (Greenow, Pearce, & Ramji, 2005; Stein et al., 2007). Elders with dementia are more likely to have poorer oral hygiene practices and experience greater risk for oral disease (Kandelman et al., 2008).

Oral Diseases

Over 1 billion dynamic diverse microflora (balance pro-healthy and pro-disease bacterial species) contribute to the oral microbiome (microbial communities) that occupy the various oral cavity niches such as the dorsum of the tongue, buccal mucosa, teeth, periodontal tissues, soft palate, and tonsils contribute to maintain a healthy and balanced physiologic oral ecosystem (Zaura, Keijser, & Crielaard, 2009). Saliva is an essential element in the oral cavity to maintain homeostasis and defend

against disease (Van Nieuw Amerongen, Bolscher, & Veerman, 2004; Krol & Grocholewicz, 2007). Biopsychosocial factors such as age, diet, smoking, alcohol, psychological stressors, pharmaceutical provocation, oral contraceptives, hormonal replacement therapy, compromised host defense, and systemic conditions will destabilize the environment, blunt the response by HPA axis to stress, alter the oral ecosystem, activate the parasitic virulent microbes, initiate disease, and impact quality of life (al'Absi et al., 2003; Gianoulakis, Dai, & Brown, 2003; Hilgert et al., 2006; Phillips et al., 2006; Kudielka & Wust, 2010; Badger, Ng, & Venter, 2011).

Chronic disease and physiologic changes increase the risk for oral diseases (Weber, 1974; Miller et al., 2001) and may result in decreased utilization of oral health care (Griffin et al., 2009). Furthermore, studies revealed that unmet dental needs were higher among elders with chronic diseases, resulting in pain and infection that reduce quality of life and affect normal daily activities.

Dental Caries

The majority of independent elderly are retaining their natural dentition with increased risk of coronal and root caries as well as tooth fractures of endodontically and nonendodontically treated teeth. Risk for dental coronal and root caries share the same etiology; however, the rate of disease expression is dependent on host biophysiological, sociobehavioral, and socioenvironmental factors that result in disease expression and not always directly correlated with fermentable carbohydrate diet (Van Houte, 1994; Beltran-Aguilar et al., 2005; Brown & Dodds, 2008; National Institute of Dental and Craniofacial Research [NIDCR]. National Institutes of Health, 2011) (Fig. 20.1). Environmental shift in oral ecosystem will shift healthy microflora to acidogenic (acid forming) and acidoduric (tolerate acidic habitat) associated with increased risk of dental caries and disease development in the elderly (Keyes, 1968). Majority of the

elderly have high dental plaque scores, multiple restored tooth surfaces, high caries risk profile, fractured and premature tooth loss (Gilbert et al., 1996; Trovik, Klock, & Haugejorden, 2000; Curzon & Preston, 2004; Petersson et al., 2004; Eldarrat, High, & Kale, 2010). Cariogenic bacterial infection of the dental pulp often evolve into pulpal necrosis and periapical lesion, with activation of lipopolysaccharides and proinflammatory cytokines IL1- β and TNF- α , and initiate the inflammatory cascade that promotes bone resorption and contribute to systemic conditions (Tani-Ishii, Wang, & Stashenko, 1995; Meager, 1999). Normal aging process will increase the risk of gingival thinning and recession to create an environment for accumulation of bacterial plaque and development of caries that affect over 60% of the elderly (Lawrence et al., 1996; Hujoel et al., 2001; Steele et al., 2001; Borrell & Papapanou, 2005). The elderly are four times more likely to have unrestored dental caries than schoolchildren due to social-behavioral risk factors like smoking and financial access to care barriers that can result in pain, infection, reduced quality of life, and death (Dye et al., 2007). Topical and systemic exposure to fluoride and good oral hygiene practices will reduce risk for dental caries (Twetman, 2009).

Periodontal Diseases

Diet accumulation of biofilm on the retentive surfaces of the natural dentition, lack of oral hygiene practices, and social habits elicit irreversible gingival inflammatory response that affect at least 17.2% of the elderly (National Institute of Dental and Craniofacial Research [NIDCR]. National Institutes of Health, 2011). Gingivitis is multifactorial reversible periodontal disease prerequisite often undetected in early stages of disease with unpredictable host defense-dependent pathogenesis and understated prevalence (Scannapieco, 2004; Eke et al., 2010). Moderate forms of periodontal disease affect all populations (Demmer & Papapanou, 2010). Advanced stages of the disease affect

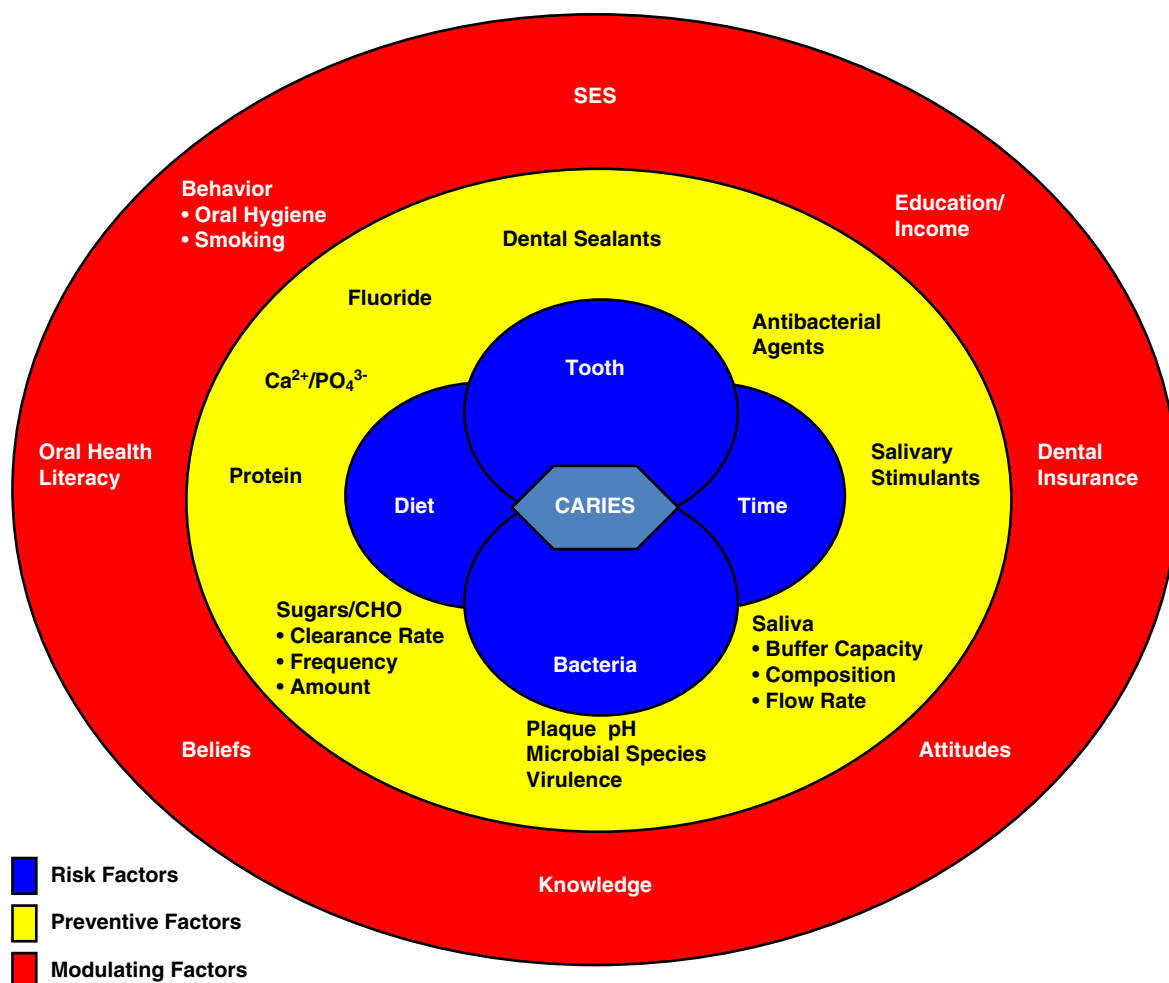


Fig. 20.1. Factors involved in caries development. Adapted from Selwitz, Ismail, and Pitts (2007), with permission from Elsevier.

10–20% of the population. Prevalence varies with sociobehavioral factors, and compromised host and local and chronic systemic conditions have been identified as precursors of disease progression and tooth loss (Ship & Beck, 1996; Dye et al., 2007). The elderly are at higher risk of disease progression (Loe et al., 1986; Lockhart et al., 2008) (Fig. 20.2).

Oral bacteria are able to penetrate blood vessels, connective tissue, and progress to invade tissues, organs, and systemic pathways that contribute to other systemic disease pro-

cesses (Paju & Scannapieco, 2007; Kamer et al., 2008; Lockhart et al., 2012). Oral bacterial toxins have been traced to trigger systemic subclinical inflammation measured by elevated levels (CRP, IL-6, and TNF- α) of biomarkers in the elderly population (Bretz et al., 2005; Loos, 2005). Poorer glycemic control is particularly associated with elevated IL-1 β cytokine levels found in gingival crevicular fluid that increase severity of gingivitis and periodontitis (Mealey & Rose, 2008; Somma et al., 2010). Elevated levels of IL-1 β and TNF- α are correlated to

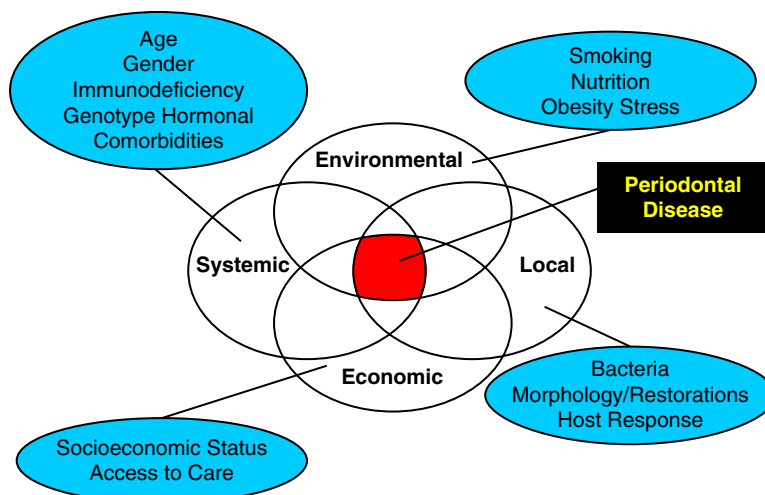


Fig. 20.2. Risk model for periodontal disease. Reprinted from Cappelli and Mobley (2008), with permission from Elsevier/Mosby.

severity of periodontal disease destruction and type 2 diabetes. Elevated levels of $\text{TNF-}\alpha$ may be associated with insulin resistance and obesity (Tilg & Moschen, 2008). Periodontal disease has been linked as a systemic risk factor to other systemic conditions such as hypertension, osteoporosis, and vitamin D deficiency (Offenbacher, 1996; Tonetti, 2009). Other studies have found that individuals with advanced periodontal disease that includes alveolar bone loss had increased risk of mortality (Garcia, Krall, & Vokonas, 1998). Patient-tailored oral hygiene instructions, as well as oral health destructive behavior modification and access to oral cleaning aids designed to meet the physical limitations of the elderly may promote disease prevention.

Edentulism

Edentulous rates have declined (26%) over the past decades as a result of oral health public education, water fluoridation, and sophisticated treatment modalities. Edentulism negatively influences oral function, facial appearance, speech, chewing efficiency, limits diet/nutritional intake, and psychosocial inter-

action (Gilbert et al., 2004; Griffin et al., 2012). Epidemiologic studies indicate edentulism is more prevalent among women with socioeconomic disparities; lack of dental insurance coverage, as well as inability to access oral care, and lower level of education affect quality of life, self-rated well-being, and self-esteem. Artificial prostheses will impair chewing efficiency by 30–40% in comparison with natural teeth, as well as impair the swallowing threshold requiring seven times more chewing strokes to mill the bolus of food prior to swallowing; therefore, food selection is compromised and is less enjoyable (Idowu, Handelman, & Graser, 1987). Impaired chewing efficiency results in consumption of low fiber, high saturated fat, less carotene, fewer fruits/vegetables, and is demonstrated to increase levels CRP, IL-6, and fibrinogen that increase the risk of coronary heart disease. Other studies have demonstrated that dietary selection is influenced more by race, culture, and SES, and is less dependent on the number of functional occlusal contacts (Gotfredsen & Walls, 2007). Edentulism contributes to a number of systemic and psychosocial conditions such as increased incidence of denture stomatitis, aspiration pneumonia, type 2 diabetes,

high blood pressure, sleep disorders, gastric lining mucosal infections, with social isolation, decreased self-esteem, and physical inactivity.

Oral Cancer

Oral cancer primarily involves the tongue, floor of the mouth, and lips, whereas oropharyngeal cancer expands to involve the posterior third of the tongue, soft palate tonsillar area, and posterior and lateral walls of the throat which accounts for 3% of all cancers and is rated as the eighth most common cancer challenging Americans (Shiboski, Shiboski, & Silverman, 2000). Pathogenesis of the disease is associated with social-behavioral habits such as use of tobacco and alcohol products, unprotected exposure to ultraviolet radiation, and inadequate consumption of grains, fruits, and vegetables (Fig. 20.3).

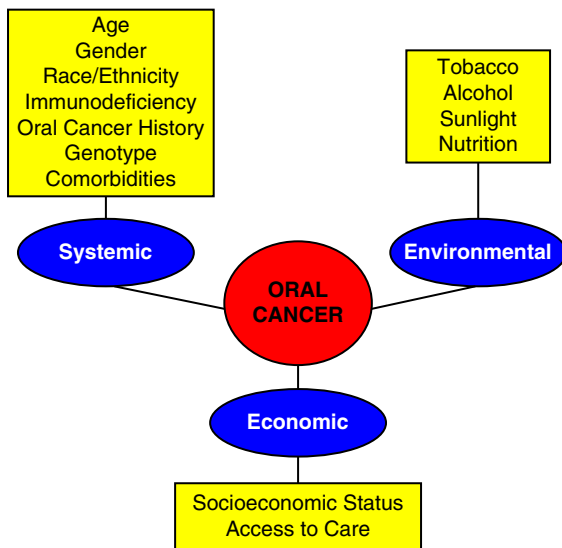


Fig. 20.3. Risk model for oral cancer. Oral cancer is a multifactorial disease process that includes systemic, environmental, and economic effects. The interplay of these variables ultimately lead to the incidence of this disease. The multifactorial nature of oral cancer should be addressed in the assessment of a patient's risk. Reprinted from Cappelli and Mobley (2008), with permission from Elsevier/Mosby.

Use of tobacco products accounts for 75% of oral cancer deaths, whereas use of alcohol is the second risk factor associated with nutritional deficiency. Other risk factors that account for 20–25% of oropharyngeal cancer is human papillomavirus (HPV), especially HPV-16 detected in the posterior third of tongue, tonsillar area, and oropharynx (Falkry & Gillison, 2006; D'Souza et al., 2007). Incidence of oropharyngeal cancer related to HPV increased annually (4.4%) during 1999–2008 among those 15–64 years of age, whereas cancer in other sites of the oral cavity have declined or remained the same (American Cancer Society, 2012). Individuals who are seropositive for HPV-16 have a 15-fold increased risk of expressing oropharyngeal cancer. Oropharyngeal cancer estimates for 2012 are 40,250 new cases, with 7850 deaths and 50% survival rate (American Cancer Society, 2012). One study suggests that every hour, one American dies from oral cancer (Kademani, 2007).

Since oral diseases are largely behavioral in origin, oral health promotion activities aimed at the elderly are fundamental to any disease prevention strategy. Health promotion is the process that enables individuals to increase control over and improve their oral health through education and prevention (World Health Organization, 1986). By developing a sound plan of prevention, the dental professional can provide the elderly with the tools to prevent their risk for future disease.

Environmental and Psychosocial Factors of Aging

Environmental Determinants

Multilevel interactive influences of individual (attitude, skills), social (formal/informal social network, family, peer group, workplace, and organization), and socioeconomic environmental (culture, media, resources, local, state, national) factors shape behaviors expressed by an individual and population that significantly

contribute to each category of disease progression (Sallis et al., 2006; Glanz & Bishop, 2010). Socioeconomic environmental inequalities cause disparities in health and promote the practice of health-compromising behaviors. Social factors play a key role in the oral health of the elderly. In the United States, employer-based dental insurance ceases upon retirement (Manski et al., 2009). Routine dental care is not offered under current Medicare guideline, whereas dental care Medicaid resources are being reduced. In addition, only a small percentage of Medicare supplemental programs offer dental benefits (Manski et al., 2011). Regular dental care becomes an out-of-pocket cost for most of the elderly and creates a profound barrier to care. Lack of geriatric-trained dental providers also contributes to barriers to care that have been characterized as a U.S. health crisis (Oral Health America, 2003). The elderly with private dental insurance are 50% more likely to visit a dentist than those without dental benefits (Brown, Goryakin, & Finlayson, 2009).

Most elderly live in urban settings, while 1.57 million reside in total care facilities; over 1 million occupy assisted-living facilities, and access to oral healthcare services is a daily challenge. Federal, state, and other regulatory agencies require that oral care services be offered to institutionalized residents; however, in a recent report, only 13% of the residents received dental care (Berkey et al., 1991; Jones, 2002; MacEntee, Pruksapong, & Wyatt, 2005; Reed et al., 2006; Dounis et al., 2012). Evidence-based governmental policy intervention to reduce health inequalities and disparities are required to shape healthy society and aging in place communities (Graham, 2004).

Social

Social communities, networks, the quality, and quantity of relationships are important predictors of cognitive function, physical/functional health, autonomy, and self-assessment of lifestyle satisfaction. Together these things portray

the complexity of healthy aging. Healthy choices are initially rooted in the socioeconomic circumstance rather than an individual behavior (Evans & Stoddart, 1990; Ewart, 1991). Social norms, values, and beliefs are shaped by the societal view of the individual, and the value the individual brings to society influences behavior. Level of education, gender, younger lifestyle practices, and rural/urban residence are important predictors of mortality. Each of these factors influences the behaviors an adult adopts or discards as they progress across a life span. The decision to seek healthcare services by the elderly is dependent upon perceptions, values, family/social network, social norms, attitudes, and cultural beliefs, as well as the elderly's past experiences or witnessed events during a medical/dental encounter. Youth-oriented societies create stigmas, negative images of older adults that translate to individuals internalizing a negative self-image that result in possible underreported symptoms of a disease (Horton et al., 2008). A growing body of evidence suggests that healthcare professionals perceive medical conditions presented by older adults as irreversible, unprofitable, and unexciting (Gundersen et al., 2005; Kane & Kane, 2005; Jopling, 2007).

Limitations with ADL reduce the opportunity for the elderly to seek routine dental care. Many dental practices are not equipped to provide care for the nonambulatory patient or patients with other significant limitations. While dental professionals treat all patients with dignity, they lack the knowledge and skills to manage the functional limitations (e.g., walking, getting in and out of dental chairs, bathing, dressing, eating) and social deficits of the elderly. Women with functional limitations endure more barriers to access to dental services than men. One study found that women with two or more limitations in ADL were 40% less likely to access dental services when compared to women with fewer limitations (Manski et al., 2011). The elderly face additional barriers to accessing routine dental care. As we age, vision and hearing deficits are more prevalent, and

therefore, transportation services are needed for the community-dwelling elderly who is living alone and to whom this may be another form of isolation.

Recent studies have reported the emergence of a new generation of elders who are actively engaged in social networks and community interests and have a quest for learning positive outlook on living despite chronic ailments (Ferrario et al., 2008). The degree of esteem accorded to the elderly is strongly correlated with the perceptions of usefulness in their families and communities (Harris & Thoresen, 2005; Gokalp et al., 2007).

Majority of the elderly will age in place in communities where they lived, grew older with their peers, and transformed communities into naturally occurring retirement communities (Federal Interagency Forum on Aging Related Statistics, 2010). A small percentage (4–5%) of older adults will participate in interstate permanent long-distance migration. Seasonal migration of elderly to regions with favorable climate, housing, and favorable tax structures favors short-term economic prosperity but transfers the burden for health care to distant rather than lifelong local communities. Nearly 1 billion people travel the world annually, with the elderly representing one-third of the passengers (World Tourism Organization. UNWTO, n.d.). An interoperable electronic health record must be available to interprofessional healthcare providers at the local, state, national, and international healthcare facilities to effectively manage chronic oral-systemic conditions presented by the elderly as they become more mobile.

Individual

Self-rated health status is a multidimensional, dynamic, objective measure of functional and psychosocial well-being and a more accurate representation of the elderly's health status (Lundberg & Manderbacka, 1996). An individual's self-perception is a reflection on decline/improvement of health, which is influenced by individual lifestyle behavioral habits, SES, and

environmental factors, and have been correlates as a more objective assessment of successful aging (Shooshtari, Menec, & Tate, 2007). Domains most significantly associated with self-rated healthy aging and well-being were independent functioning, physical condition, personal control/autonomy, and responsibility (McMullen & Luborsky, 2006). Most adult social habits are adopted during early adolescence. These instilled habits contribute to morbidity and mortality later in life. Effective early intervention programs to promote healthy lifelong behaviors and habits can prevent health-compromising behavioral practices (Dobbins et al., 2009). Negative self-perception of health has been linked to increased complexity of chronic conditions and hospital admissions. Optimistic attitudes and behaviors will accelerate surgical recovery, promote ability to repair damaged tissue, and promote resistance to disease and illness.

Race Gender

Fifty percent of the elderly population is projected to be more racially and ethnically diverse by 2100. The elderly of Hispanic origin will represent the largest (20%) racial/ethnic minority by 2050 followed by the elderly of Asian origin. Racial and ethnic diversity will affect variability in living arrangements, life expectancy, social economic status, and level of education. The elderly with high school diplomas and bachelors degree have increased in number over the years; however, African Americans and Hispanics have the lowest educational achievement and have substantially lower income. Higher level of education is associated with more positive self-perceived health and use of healthcare services among the elderly (Idler, 1993). Increasing economic disparities and earning distribution have health and well-being implications. There is conflicting evidence on compliance and use of healthcare services among elderly men and women (Hulka & Wheat, 1985; Verbrugge & Wingard, 1987). However, the women have longer life span, are diagnosed with conditions

that are more chronic, and are more likely to use healthcare services (Murphy & Hepworth, 1996).

Cultural Aspect of Health

Culture has been referred to as a complex dynamic, continuous, coping mechanism, learned way of life shaped by people that share similar beliefs, values, customs, and norms, passed down from generation to generation that may unite or divide people. Multiple socialization experiences instill culture in individuals and become a powerful filter through which information is received and processed that effect utilization of healthcare services, health outcomes, and well-being from birth until death. Health-related behaviors, beliefs, values, attitudes, practices, use of therapeutic services, and health services outcomes are related and shaped by culture that can serve as a therapeutic barrier or resource for the individual as well as the cultural community (Haas et al., 2004). Core cultural beliefs of immigrants remain unchanged even after assimilation into western culture. Transformative power of information technology and penetration of media across cultural boundaries may lead to greater infusion of ideas influencing values, norms, identities, and construct of assumptions. Research has found that individuals are more likely to accept health-related recommendations from people they like, respect, and with those they share common traditions and beliefs (Anderson, 1987).

Approximately 90 million adults lack the literacy skills to improve their overall well-being; less than 50% of the elderly access the Internet, whereas 50 million encounter barriers and are unable to access Internet health-related content (Lenhart, 2000). Literacy goes beyond reading, writing, and communicating is the elderly's ability to understand and remember recommendations made by clinicians and obtain needed services to self-manage their oral-systemic chronic conditions (Office of Minority Health [OMH], 2001). Some of the elderly have

literacy skills below high school level. They are poor, minority populations, and groups with limited English proficiency, such as recent immigrants. Studies have found that the elderly with limited oral-systemic health literacy have limited knowledge and understanding about their chronic diseases and are less likely to use health-preventative services and are most likely to report adverse outcomes (DeWalt et al., 2004, 2006, 2010; Dye et al., 2007). Recent studies assert that nondental healthcare professionals have insufficient training and lack knowledge of oral-systemic impact on health and do not examine the oral cavity during routine physical examination (Quijano et al., 2010; ACGME, 2012). Others have concluded that health information brochures are full of jargon and obscure words, and are not directed to the target audience, resulting in communication gaps and undesirable health behaviors (Rudd, 2007). Multicultural communication skills are required to ensure healthcare professionals effectively communicate with patients of all ages and cultures (Xakellis et al., 2004; Cannick et al., 2007). Briefly, it has been recommended that clinicians adopt (1) welcoming attitude, (2) maintain eye contact, (3) use plain nonmedical language with use of graphics, (4) slow down, (5) break information into short statements, (6) focus on few key concepts, (7) check understanding using teach-back, and (8) encourage patient/family participation (DeWalt et al., 2010).

Western medical philosophy and management of illness is scientifically based; illness and disease are measured and observed where the mind, body, and spirit are separated. This approach may be in direct opposition to certain cultural health beliefs and may create an environment of misunderstanding, mistrust, nonadherence, misdiagnosis, and adverse health events. Eastern cultures' approach to healing is holistic: the mind, body, and spirit are essential to health and illness referred to as alternative medical system. Asians, Pacific Islanders, Native Americans, and Hispanics have adopted traditional alternative medical models of care (Salimbene, 1999; Lai & Surood, 2009).

Common Behavioral Oral-Systemic Disease Risk Factors

Diet and nutritional consumption have been associated to contribute to a number of oral-systemic conditions. Consumption of high saturated fats and carbohydrates, and low intake of fiber, fruits, and vegetables, as well as sedentary lifestyle practices, are associated with elevated CRP, IL-6, and increased risk of chronic oral-systemic conditions.

Smoking has been identified as a psychosocial risk factor for oral-systemic disease that is related to periodontal disease and poor oral health/hygiene, and contributes to the development of 30% of all cancer and associated comorbidities and 90% of lung cancer. Exposure to cigarette smoke will initiate inflammatory response of tissues and organ systems, primarily affecting the airway and leading to injury, remodeling, and chronic inflammation.

Stress/Control has been related to individual and environmental factors. Lack of control, low socioeconomic factors, caregiving, and health inequality have been recognized as psychosocial factors that compromise oral-systemic conditions. Elevated levels of salivary cortisol have been linked to extent and severity of periodontal disease and temporomandibular joint dysfunction that may exacerbate chronic systemic conditions, frailty, and demise.

Alcohol is a psychosocial behavior habit initiated during years of adolescence with short-term enhanced mood influenced by social and environmental factors that affect chronic oral-systemic conditions. Consumption has been associated with traumatic injuries; chronic use will lead to neurological, cognitive impairment and increased risk of suicide.

Hygiene in general is necessary to reduce inflammatory toxins and improve oral and systemic health. Effective removal of the oral microbiome has been associated with good oral health and reducing risk of chronic inflammatory systemic conditions such as heart disease, diabetes, aspiration pneumonia, and infectious diseases.

Physical inactivity has been shown to increase the risk of multiple chronic systemic conditions, such as falls, cardiovascular disease, diabetes, obesity, frailty, and osteoporosis, and Alzheimer's as well as increased inflammatory markers compromise the immune system that will impact oral disease (Sheiham, 2000; Sheiham & Watt, 2000).

Oral-Systemic Risk Assessment and Intervention Strategies

Oral healthcare practitioners have the opportunity as part of the primary healthcare team to assess the physical, behavioral, and social risk factors that contribute to the pathophysiology of chronic oral-systemic conditions. Social (low SES, culture, chronic stress, depression, social isolation) and behavioral (tobacco, alcohol, stress, diet, physical inactivity, hygiene) risk factors contribute to pathophysiologic breakdown of tissues and organs that result in disease progression. Self-assessed health (the will to live) is a powerful predictor of mortality that measures how the elderly perceives their own health. The simple question of "How is your general health" has resulted in the responses that will go beyond the physical aspects to extend to attitude/perceptions and socioeconomic barriers that contribute to their physical status. Table 20.2 provides a framework of open-ended self-rated questions on the determinants of health. The elderly often use their physical and functional health status as a reference in rating their own health and compare it to others in their own age group as well as other age groups. There are several objective measures to assess health; however, self-rated health has been a predictor of self-esteem, social support, and a predictor of future self-rated health (Simon et al., 2005; Shooshtari, Menec, & Tate, 2007).

Oral Risk Assessment

Normal aging is a multidimensional process that impacts all systems, resulting in increased individual frailty and disease (Kirkwood, 2008).

Table 20.2 Self-Rated Oral-Systemic Risk Assessment for Older Adults with Chronic Conditions

Determinants	Risk-assessment questions
Oral-systemic assessment	• Self-rate general and oral health using a five-point scale ranging from excellent to poor and follow-up “what is the most influential factor in your evaluations?” • Rate other factors that may include physical symptoms such as (i.e., overall/general feeling, independent function, physical condition, chronic pain, depression/mood, control/stress, chewing efficiency, oral pain, diet/nutritional intake) • How would you assess your general health status compared to others your age? • In the past 30 days, has your physical, cognitive, functional health impacted your daily routine? And if so how? • Are you able to concentrate? Are you able to manage your finances?
Behavioral assessment	Using a five-point scale • How would you rate your self-image? How often are you engaged in social activities, community events, spiritual involvement, and social relationships? • What is your perception of your oral cavity (teeth, gums, breath, chewing efficiency, swallowing difficulty)? How often in the last 30 days did you engage/participate oral hygiene practices? • How often do you have negative feelings, sadness, depression, anxiety, and hopelessness? • How often during the last 30 days did you consume an alcoholic beverages and how many beverages are consumed each day? How often during the last 30 days did you use tobacco products and how many did you use each day?
Socioeconomic assessment	• How often do you participate in physical exercise? • What is the highest level of education that you have completed? • Are you currently employed? And if so, what is your occupation? How often do you work? • What type of medical/dental insurance do you have? • How comfortable are you with filling out medical forms for yourself? • How often do you have difficulty understanding written information your healthcare provider gives you? • How involved is your family/friends in supporting you manage your condition • How well are you and your family doing financially in comparison to others in your age group? • In the last 30 days, were you able to access and use oral/systemic healthcare services? In addition, how often were services used? • In the last 12 months, have you received influenza vaccine? In the last 5 years, have you received pneumococcal vaccine and herpes zoster vaccine?

These irreversible changes also impact the oral cavity, often resulting in an increased prevalence of oral disease and impairment. Moreover, these changes are affected by biological, behavioral, and social constructs that play a profound role in the individual's oral health. Oral diseases are recognized to be preventable and multifactorial, with an origin that is largely

behavioral (McGrath et al., 2009). Unlike previous generations, more of the elderly are keeping their teeth. Health promotion strategies are well-suited to addressing a reduction in the prevalence of oral disease; however, it is important for dental professionals to recognize the complex biobehavioral interactions that result in oral diseases.

Risk assessment and patient counseling based upon an individual's risk for disease is a concept that is well-developed in the medical literature and is becoming increasingly recognized in the dental literature (Cappelli & Mobley, 2008). The principles of risk assessment are to (1) assess the risk of the individual patient for the future development of disease; (2) identify the individual etiologic factors that describe the existing disease; (3) provide a basis to explain to the patient how to prevent disease and to communicate and facilitate needed change in behavior; (4) lead to an individual plan of prevention tailored to the patient's risk factors; and (5) evaluate the success of the preventive plan and/or the need to modify it (Dounis et al., 2010). Utilizing a risk-based approach to the application of a preventive strategy that considers both biological and behavioral factors is the foundation of a comprehensive health promotion program. When addressing the oral health risk of the elderly, the dental provider needs to consider different oral health challenges that may require a different approach to an overall oral health promotion strategy (Petersen & Yamamoto, 2005).

Risk assessment for oral diseases in the elderly, with a primary focus on dental caries, periodontal diseases, and oral cancer, should include an assessment of factors/indicators associated with normal aging. Loss of mobility, polypharmacy, changes in nutritional intake, and increased xerostomia among other factors play a key role in the exacerbation of oral diseases. Environmental factors that affect oral health, including smoking and alcohol use, can contribute to a greater risk for oral diseases. In addition, diet, nutrition, obesity, stress, xerostomia, fluoride exposure, and ADL contribute to an increased risk for future oral disease (Evarard et al., 2000). The evidence for an association between oral diseases, primarily periodontal disease, and systemic disease is mounting. Potential links exist between periodontal disease and diabetes (Mealey, 2006; Mealey & Rose, 2008), cardiovascular disease (Geismar et al., 2006), osteoporosis (Persson et al., 2002), and

respiratory diseases, including aspiration pneumonia (Scannapieco, 1999). Studies have shown that controlling for systemic disease can impact periodontal disease severity (Simpson et al., 2010). More than 80% of individuals with Medicare have one chronic disease, and 20% experience five or more chronic conditions (Dounis et al., 2011). Many of these chronic conditions have ramifications on the oral cavity.

Risk markers, including age, gender, race/ethnicity, genotype, comorbidities, medications, previous oral disease history, and immunodeficiency are systemic factors that contributed to an altered risk for oral disease (Dounis et al., 2010). Local factors, including bacteria, host response; presence of dental sealants and restorations, tooth morphology, and gingival recession can impact the overall risk status of an individual (Dounis et al., 2010).

The medical and behavioral history of the patient plays a key role in understanding the risk status of the older patient. A thorough medical history can illuminate the potential impact of polypharmacy through the medication history. Comorbidities, including diabetes, cardiovascular disease, and gastroesophageal reflux disease (GERD), and the effect of oral diseases can be ascertained. In addition, a complete history can elucidate physical limitations and disability.

A clinical examination with radiographs allows the dental professional to detect both frank and incipient caries, periodontal disease induction and/or progression, and the presence of a suspicious lesion that may be indicative of oral cancer. The elderly as a group are at a higher risk for developing root caries. The dental professional should be aware of areas of exposed root surfaces due to gingival recession and accumulation of plaque in these areas. Having access to historical information about the older patient's oral disease is critical to developing an accurate assessment of the patient's risk for future disease.

Xerostomia is a condition that has an increased prevalence in those over 65 years of age. While xerostomia is linked to normal aging,

it is exacerbated by polypharmacy and disease processes. The softer diet can also lead to xerostomia in the elderly. Salivary flow is stimulated by chewing. Also, many foods that stimulate salivary flow (fresh fruits and vegetables) are healthier. The dental professional can measure the quantity of saliva and develop an approach to control the effects of xerostomia. To determine whether your patient is experiencing symptoms of xerostomia, there are four questions that have been validated that can be used by the dental professional to screen patients who may be at risk for xerostomia (Fox, Busch, & Baum, 1987): (1) Does your mouth feel dry when eating a meal? (2) Do you have difficulty swallowing food? (3) Do you have to sip liquids to aid in swallowing? and (4) Is the amount of saliva in your mouth “too little” most of the time? Affirmative responses to these questions suggest that your patient may be experiencing xerostomia and should trigger a measure of salivary volume. When assessing a patient’s risk for oral disease, the dental professional should consider those factors and behaviors that mitigate the disease process. Preventive behaviors and practices reduce the patient’s risk for future disease. For the elderly, the question about the ability to maintain adequate oral hygiene is a paramount concern. Certainly, if the elderly patient is demonstrating cognitive or physical limitations that preclude their ability to maintain their own oral hygiene, the dental professional should engage the assistance of a caregiver and/or schedule more frequent professional cleaning appointments to reduce the risk for future disease.

In addition to oral hygiene, consumption of fluoridated water is another key preventive measure. Elders should be encouraged to maintain hydrated and use fluoridated water as a preventive measure. These practices should help to reduce the incidence of new carious lesions.

Considering oral health quality of life (QOL) as a component of risk assessment for oral disease, the dental professional needs to explore psychosocial ramifications of dental conditions. Along with pain and infection, the dental profes-

sional should examine function, appearance, and self-esteem as these variables are linked to the oral condition. Pain, infection, tooth loss, and xerostomia that is often seen in elders can have a profound effect on the quality of life. These conditions can result in deficits in speech, diet, and nutrition. Also, the resulting inability to wear removable prostheses can lead to lowered self-esteem and social isolation (Kandelman et al., 2008).

While there are several measures of oral health-related quality of life (OHRQOL), the most simple are the three factors identified by MacEntee, Hole, and Stolar (1997), notably, (1) lack of pain, (2) ability to maintain oral hygiene, and (3) disease-free mouth. Several other oral health quality of life measures are noted in the literature (Jones, 1998; White, 1998; Hebling & Pereira, 2007). Most of these measures are for use in population-based research and have limited utility for clinical care settings.

Behavioral Intervention

Economic, social, and political, cultural, emotions, values, social norms, and family factors shape individual behavior that may be health promoting or destructive. Existing behavioral modification models that address lifestyle behavioral change have strengths/limitations and only few studies have focused on the effectiveness of the intervention in the elderly. Clinical application of health behavioral intervention models in the elderly may result in short-term desirable behavioral change with evidence of relapse and inability to sustain desired outcome (Norris, Engelgau, & Narayan, 2001). Other studies have shown that population-based behavioral intervention will have a greater impact on sustaining the health-enhancing behavior than individual-focused intervention (Glasgow, Vogt, & Boles, 1999; Glasgow et al., 2001). It has been recommended that primary healthcare provides use the 5A’s (Table 20.3) framework to manage the health destructive behaviors (Whitlock et al., 2002). Behavioral intervention requires willing and motivated

Table 20.3 Behavioral Intervention

Assess	Assess the biopsychosocial behaviors of the elderly and self-efficacy to tailor intervention to individual needs and intentions.
Advise	Using the elderly values, concerns, and symptoms, tailor counseling session on health risks, behavior history, advantages of behavioral change. Personalized and conform frequency amount and intensity of interactive counseling sessions to elders' thoughts, feelings about the recommended intervention.
Agree	Mutually negotiated patient-directed detailed action plan will need to be developed to meet the elderly healthcare goals that empowers older adult to self-manage their chronic condition.
Assist	Assist the elderly to identify personal barriers, community opportunities, and problem-solve to overcome identified barriers.
Arrange	Follow up to assess, assist in adhering to self-management of behavioral change.

participant, and the goals need to be tailored to individual's stage of chronic disease process and self-identified barriers to achieve the desired goal (Sheppard, Hartwick, & Warshaw, 1988; Andersen, 2000).

Individual acknowledgment of harmful behavior is awkward and is often difficult to admit with signs of ambivalence about the desired behavior. Clearly outlined treatment modalities and goals tailored to elders' needs, desires, and values will promote control, satisfaction, and relief of symptoms, and offer the support to adhere to the recommended intervention. Inclusion of other healthcare providers may be required to achieve the desired outcome. Motivational interviewing is a two-phased patient-centered approach that identifies willingness to adopt and adhere to healthy lifestyles that may be effective to improve a variety of behaviors including dental caries reduction,

grieving, unhealthy dietary habits, fear, and smoking cessation (Rollnick & Miller, 1995; Freudenthal & Bowen, 2010; Lai et al., 2010). In the first phase, the clinician needs to build good rapport and establish goal to enhance readiness to enable desired behavioral change. The second phase focuses on the process of change and commitment to adhere to desirable behavior. Principles of motivational interviewing (1) express empathy and reflective listening, assess the needs and risk of disease progression, build good rapport, develop a therapeutic partnership, (2) identify older adults' personal oral-systemic disease knowledge, values, beliefs, and goals and distinguish from professional goals as well as future goals of the older adult, (3) advise risks and benefits of lifestyle changes on disease compression/prevention options, assist the older adult to identify solutions based on their own values, and assist in setting goals to their identified barriers, (4) support self-management by focusing on the individuals own ability to make and sustain lifestyle changes. This interventional approach enables clinicians to identify intrinsic and extrinsic motivating factors to change undesirable behavior. Meta-analysis of controlled clinical trials has shown that implementation of motivational interviewing resulted in similar outcomes with other therapies and yielded in moderate effects in comparison to nonintervention for the psychological intervention (Burke, Arkowitz, & Menchola, 2003). Pharmaceutical intervention is also a therapeutic option; however, this is often discouraged in the elderly due to adverse oral side effects and may lead to dependence.

Self-management patient-directed approach allows the elderly to partake in the development of the action plan and take responsibility for his or her own health (DeBusk et al., 1994). This approach may be available online; the support/interactive guidance to behavioral adoption may result in desirable outcomes instead of the traditional provider-prescribed therapeutic regimens that require compliance and often result in suboptimal adherence and escalating healthcare costs (White & Dorman,

2001). Elders' self-efficacy (own ability/competence to perform specific task/behavior) is crucial to effectively cope with the demands of self-managing chronic oral-systemic condition. Elders' beliefs, values, course of action, amount of time and effort they are willing to invest as well as overcome adversity may be predictors of effectiveness of self-management. Individuals with high level of self-efficacy approach challenging tasks with a strong sense of commitment, set goals, and heightened efforts to reach their goals. Such an outlook has been shown to reduce stress, promote self-accomplishment, and lower levels of depression. Daily self-management of lifestyle choices has a more powerful impact on disease progression than traditional provider-prescribed regimen of care. Studies have shown adopting this approach may lead to positive patient-provider relationship, enhanced patient satisfaction, and improved emotional well-being; ease physical symptoms; and improve adherence to goals and autonomy of oral-systemic condition. Successful self-management requires access to services, healthcare professionals, and resources that promote and sustain healthy behaviors (Fisher et al., 2005).

Sustaining the lifestyle change may challenge the elderly and promote the onset of depression, relapse, and nonadherence. Nonadherence has often been related to socioeconomic factors, health literacy, patient education, beliefs, acceptance of therapeutic regimen, and adverse effects of medication (Winnick et al., 2005). Relatively few studies revealed a significant improvement in physical activity, diet, cholesterol, and blood pressure in the elderly. In other age groups, over 80% of participants did not sustain to difficult lifestyle behavioral changes such as smoking cessation and recommended dietary restrictions (National Heart, Lung, and Blood Institute [NHLBI], 1998). Adherence often is motivated by the type of recommendation. Advice that prompts immediate response (i.e., pain relief) will increase the level of adherence; however, long-term preventative recommendation have lower level of adherence (Dunbar-Jacob et al., 2000). Nonadherence reasons included provider

did not clearly communicate prescribed course of therapy, resulting in confusion; the therapeutic recommendation may interfere with daily routine; financial constraints to prescribed regimen; and lack of information about the effects of nonadherence. Studies have clearly shown that lifestyle/behavioral intervention that promotes healthy diet, exercise, improved oral hygiene practices, reduced smoking, and self-examination are more cost-effective and may be able to suppress even reverse expression of disease without pharmaceutical interventions (Ornish et al., 1990).

Cognitive Behavioral Therapy

Depression has been associated with chronic oral-systemic conditions and is often underdiagnosed. Symptoms of depression will have an unfavorable effect on adherence to treatment modalities and increase the susceptibility of illness. Low self-efficacy to exercise control over negative disease thoughts contribute to the occurrence duration and recurrence of depression episodes. Negative thoughts deteriorate self-efficacy and confidence to manage disease process. Cyclic events of negative thoughts and disease progression can eventually lead to ambivalence about the management of the disease. Cognitive behavioral therapy is psychotherapy that has been applied in the management of mental illness, such as anxiety and depression (Pinquart, Duberstein, & Lyness, 2007). It examines the relationship between thoughts, feelings, and behaviors. It is focused on exploring the negative pattern of thinking and feelings that lead to the self-destructive action. The main goal of the therapy is to change thought behaviors associated with the feelings to more adaptive and coping. Interactive online treatment modalities may be available as well as one-on-one therapeutic session.

Developing Prevention-Focused Oral Health Plan Based Upon Risk Assessment

The creation of a tailored plan of prevention for the elderly patient includes an assessment of

the current risk markers/factors and examines appropriate interventions that mitigate the long-term impact of these factors on overall health and oral health. When tailoring a prevention plan, the key is to identify the risk factors that contribute to the current disease process or place the patient at greater risk for future oral disease and identify preventive strategies to reduce the burden of oral disease. Developing a plan of prevention for an elderly patient may require additional considerations. In the aging patient, the medical and behavioral history provides a context for preventive approaches.

When developing a preventive plan for elders, the dental professional must also consider the living situation of the elderly. Differences in the ability of the individual to manage their own lifestyle and ADL should be factored into the prevention plan. The ability of community dwelling elders may vary significantly from those living in assisted living or those elders living in nursing homes. The dental professional should consider the differences in diet, assistance with daily oral hygiene, and mobility for the patients living independently or in a nursing facility. In all cases, understanding and addressing the limitations of different living situations is a key component of a successful prevention plan.

After completing an oral health risk assessment, the dental professional should consider medical and dental factors that contribute to the patient's risk for future disease. Systemic diseases and the medication history should be considered and the potential impact on the future risk for oral disease. Conditions described in the previous section should be addressed in the prevention plan, especially xerostomia, if present.

Understanding risk behaviors that contribute to oral diseases is an important component of developing an individual prevention plan. Tobacco use, alcohol consumption, and diet are the three key variables that should be assessed. The frequent consumption of fermentable carbohydrates should be discussed. The prevention plan should outline a plan to reduce the intake of carbohydrates for individuals who are

at a higher risk for caries. Adequate water intake is important and consumption of fluoridated water should be emphasized.

For the elder patient, consultation with the physician or other care providers is a key step in the process of creating a preventive plan. This consultation allows the dental professional to better understand the general health of the patient, as well as any limitations that would influence the plan. This information can be helpful in guiding the preventive plan. Information that can be helpful includes any comorbidities that can impact the patient's oral health, including a medication history, the cognitive capacity of the patient, and any physical limitations. Also, this meeting can assist the dental professional in gaining support for preventive strategies that you will be proposing for the patient.

Fluoride exposure should be assessed for the high caries risk patient. If necessary, several approaches can be implemented to increase fluoride exposure. One method is the recommendation of an over-the-counter fluoride rinse. These rinses have a low concentration of fluoride; however, they are easy to access and are relatively inexpensive. A second option is a prescription fluoride that can be used at home (e.g., PreviDent®). While containing a higher concentration (1.2% fluoride) of fluoride, prescription items are more difficult to obtain and are usually more expensive. The dental professional may want to consider a more frequent recall schedule to apply either a fluoride gel or fluoride varnish on a more frequent basis (every 3 months). Finally, brushing with fluoride toothpaste should be recommended for every patient.

The ability to maintain adequate oral hygiene may diminish with age. Elders may need assistance with ADL and toothbrushing, and flossing may no longer be feasible for an elderly patient with physical limitations. Caregivers who are charged to assist the elderly in completing ADL should be provided instruction on brushing and flossing techniques. Oral hygiene aids should be explained that can make the task simpler and easier. Opportunities to use the devices and working with the caregiver should

be a component of the discussion of the prevention plan. Another option is to place the patient on a more frequent recall schedule for professional removal of plaque and calculus.

Antiseptic and antimicrobial rinses are available to reduce the bacterial burden that is in the causal pathway for both dental caries and periodontal disease. Chlorhexidine gluconate (0.12% solution) has been shown to reduce plaque and bleeding on probing. It has been shown to be effective in hospital-associated and ventilator-associated pneumonia, especially for patients with a high risk for oral disease (Southern et al., 2006). Cetylpyridinium chloride mouth rinse has been found to reduce plaque, gingival inflammation, and bleeding (Kollef, 2004). When choosing a mouth rinse, the dental professional should be aware of any limitations with swallowing and should not recommend a mouth rinse containing alcohol for patients who are experiencing symptoms of dry mouth.

Xerostomia is a common condition among the older patient. In many cases, the condition is controllable with adjunct therapy and counseling. Simple suggestions, including increasing water intake, use of sugar free or xylitol gums or mints, or use of over-the-counter remedies (e.g., Biotene) may be adequate to relieve dry mouth symptoms. If the condition is more pathologic (unstimulated salivary flow rate ≤ 0.1 mL/min or stimulated salivary flow rate ≤ 0.5 mL/min), the patient should be referred to a specialist in geriatric dentistry for further analysis.

The cornerstone of any preventive therapy is counseling. As a part of the discussion with the patient, the dental professional needs to know if the patient is willing to incorporate the plan into their daily routine. For a plan of prevention to be successful, the patient must be a partner in the adoption of the plan. Adherence to preventive practices has been shown to be approximately 50%; however, adherence is more likely when “patient-centered” practices are utilized (motivational interviewing) (Mobley et al., 2008). Older adults with vision or hearing deficits may require additional time to explain the prevention plan and obtain buy-in. In addition,

patients with a low health literacy level will require additional time to explain the rationale for your proposal. Prevention plans are not static, especially with elderly patients. Medical histories can change rapidly, and the prevention plan should be flexible to meet the ever-changing needs of the elderly patient.

Edentulism increases with age due to a number of factors. For the edentulous or partially edentulous patient, education about caring for the denture and the oral cavity are important. The prevalence of edentulism in the United States is declining, and it is expected that this trend will continue. However, regular dental visits are important to ensure that the fit of the prosthesis allow for optimal function. In addition, edentulous patients are at risk for other oral conditions, including denture stomatitis, angular cheilitis, and oral cancer. Denture-related complications are more prevalent in institutionalized elderly.

Assessing the risk of an older patient for oral disease in the future and the creation of a preventive plan requires the consideration of biological, behavioral, economic, and social factors. Factors/markers that interplay to contribute to an increased risk for oral disease need to be considered and addressed in developing a plan of prevention for the older patient. Developing a plan of prevention for the older patient requires that the dental professional explore all aspects of the oral disease causal spectrum, including biopsychosocial, clinical, biomedical, and behavioral factors that influence the oral health of the elderly.

Modern Technological Advancements

Technological advancements such as the smart pillbox, blood pressure sensors, blood glucose monitors, sensor toothbrush that registers physiological data, as well as adherence to therapeutic regimens are available, and are being refined. Information technology allows the continuous monitoring of chronic condition, data collection to support clinical decision, and intervention options available to the elderly, caregiver, as

well as the healthcare provider. This method is preferred by patients and allows efficient communication between patient and healthcare provider to enhance adherence to care as well as prevent adverse effects to therapeutic regimens (Arena, Hightower, & Chong, 1988; Arena et al., 1991; Harris Interactive, 2001). Furthermore, it provides individualized health information to the elderly/family to meet their unique health needs. Interactive programs that include interactive health games with real-time feedback have been implemented to diverse populations with positive outcomes. This approach enables the information and intervention provided to be relevant, timely, and tailored to empower the patient to self-directed care (Bisson et al., 2007). Other forms of communication that may be effective in behavioral modification include tailored print health information, telephone-delivered health information and behavioral intervention, and interactive Internet health communication. However, these applications have not reached the disabled, vulnerable, and diverse populations (Bental, Cawsey, & Jones, 1999). Vulnerable and culturally diverse elderly may have limited access to online health information, and the available information may not be tailored to their specific healthcare needs and may lack scientific evidence (Cline & Haynes, 2001).

Caregiver/Family Intervention

Spouse of an ill or disabled older adult is faced with tremendous stress that will accelerate his or her own physical decline. Studies have shown that the management of someone with cognitive impairment will increase the allostatic load on the neuroendocrine and immune system, blunt T-cell proliferation, increase cortisol level with increased levels of stress, compromise caregivers' wound healing ability to thwart disease, promote premature aging, and increase rate of mortality. Psychoeducational intervention offers disease progression and management training as well as provides options such as relaxation and respite programs

to reduce the levels of stress and improve adherence to treatment modalities (Campbell & Patterson, 1995). Strong family and social network has been shown to reduce the stress on the caregiver as well as delay institutionalization of the cognitively compromised elderly. Scientific evidence is limited regarding family intervention in the management of elderly with chronic conditions.

Summary and Conclusions

Health is shaped by an interaction of biological, physiological, behavioral, environmental factors that unfold over the course of life. Behaviors are shaped by individual, social, political, economic factors. This chapter addressed the biopsychosocial challenges of the elderly in managing their oral healthcare needs. Improving oral health will require (1) a healthcare workforce with knowledge, attitudes, and skills to manage lifestyle-compromising behaviors in the elderly with chronic oral-systemic conditions; (2) access to oral care; and (3) promotion and maintenance of health-promoting behaviors to reduce the burden of chronic conditions.

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21

Health Behavior and Dental Care of Diabetics

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Key points

- To achieve good health behavior in oral and diabetes care, collaboration between diabetic patient, dentist, and other medical professionals is highly recommended.
- There is a bidirectional link between diabetes and periodontal infection: periodontitis might have a negative impact on metabolic control and progression of complications, while poorly controlled diabetes and diabetic complications increase the risk of periodontal infections.
- Prevention and early diagnosis of periodontal diseases are important goals for diabetic patients, especially for children, adolescents, and patients with poor metabolic balance and complications.
- The goal of treatment is to eliminate periodontal infection/inflammation effectively. Regular maintenance care is important to minimize the risks to general health.
- Dentist should be aware of the special features in the treatment of diabetic patients, such as how to handle emergency situations, the need for sterile, antitraumatic treatment, and the use of prophylactic antibiotics.

Introduction

There are about 150 million people with diabetes mellitus. The number is expected to rise to 300 million by the year 2025. In particular, the prevalence of type II diabetes is rapidly increasing, and it also involves young patients. Diabetes mellitus and related complications in the eyes, kidneys, heart, blood vessels, and nerves affect the patients' quality of life, demand considerable medical resources and causes morbidity. Thus, the effects of diabetes on both a personal level and in the economy as a whole will grow significantly in the future.

It has been shown that oral diseases are associated with diabetes mellitus (Lakschevitz et al., 2011; Lalla & Papapanou, 2011). Diabetic patients have a 2–3 times greater risk of suffering from periodontal disease than nondiabetics (Marigo et al., 2011), and it has been found that diabetics are about 5 times more likely to be partially edentulous than controls (Moore et al., 1998). Diabetics also have a higher risk of xerostomia and oral mucosal lesions, and they may have impaired wound healing. On the other hand, the relationship is postulated to be bidirectional: periodontitis as a chronic infection might impair metabolic control and increase risk of renal complications (Shultis et al., 2007).

Several plausible biological mechanisms have been presented to explain the observed connection between diabetes and oral health. Nonenzymatic formation of advanced glycation end products predispose to many cell and tissue changes, for example, changes in inflammation response and collagen metabolism. In addition to a causal link brought about by biological mechanisms, it is possible that part of the association is coincidental, which means there might be risk factors in common, such as smoking and other lifestyle factors. Similarly, common psychological factors which affect health behavior in dental and diabetes self-care can give significant insight into the relationship between diabetes and oral health.

Knowledge about oral diseases among diabetic patients is poor (Sandberg, Sundberg, &

Wikblad, 2001; Yuen et al., 2009). Good self-care is essential to maintain a good state of health, and therefore, every effort must be made to remove obstacles to optimal self-care. Diabetic patients require regular checkups and special attention by dental professionals. In order to have an impact on the behavioral aspects of diabetic patients' self-care practices, the whole dental appointment situation should be made safe and confidential. This means that dentists must be able to assess and prevent medical risks for diabetics as dental patients. To ensure good healthcare results, dental professionals need to be conscious of the special needs of diabetics as dental patients. On the whole, close collaboration between diabetics, dental practitioners, and other healthcare professionals is called for. This would allow them to share the responsibility for good health behavior in oral care and diabetes, making it possible to understand that oral health is an integral part of general health.

Diabetes Mellitus and Oral Diseases

Several studies have shown that more gingival bleeding, more sites with pathological periodontal pockets, and extensive alveolar bone loss is found in diabetic patients than in nondiabetics. However, diabetics form a very heterogeneous group, and it is therefore important to recognize those diabetic features which, as risk indicators, determine the association between diabetes and oral health.

Researches have shown that poor metabolic control (Tsai, Hayes, & Taylor, 2002), long duration of disease (Hugoson et al., 1989), and diabetic organ complications (Tervonen & Kärjalainen, 1997) seem to be significant in making periodontal disease worse. Metabolic syndrome is a predisposing disease to type II diabetes, and recent studies have also shown a view of connection between metabolic syndrome and periodontitis (Morita et al., 2010; Timonen et al., 2010) and also between insulin resistance and periodontal diseases (Benguigui et al., 2010;

Timonen et al., 2011). The predisposing influence of diabetes to periodontitis has even been found among children (Lalla et al., 2007). Furthermore, it has been proposed that a number of diabetes-related biologic changes can also increase the risk of periodontitis. These are impairment of polymorphonuclear leukocyte function, decrease in collagen synthesis, and increase in glycosylated proteins, proinflammatory cytokines, as well as collagenase activity (Soskolne, 1998; Lalla et al., 2000). The effects of hyperglycemia on periodontal disease at the cell level are shown in Table 21.1.

Diabetes mellitus leads to a hyperinflammatory response in the periodontal microbiota and impairs repairing processes. Important cytokines in this inflammation progress are, for example, IL-1, IL-6, and TNF- α . There is evidence of weakly controlled patients who show high levels of interleukin-1 β , which together with the prolonged expression of tumor necrosis factor could cause major damage during an inflammation process (Marigo et al., 2011). A positive relation between periodontal inflammation and glycemia has been found, and moreover, glucose accumulation in crevicular fluid may cause an increase in spirochetes and bacteria. However, no significant differences in the level of periopathogens between diabetics and nondiabetics has been found.

The interrelationship between diabetes and periodontal diseases is bidirectional, as observed in the introduction. It has been shown that periodontal treatment affects metabolic control and thus leads to better general health in diabetics (Wijnand, Gerdes, & Loos, 2010). However, this positive effect of periodontal treatment is more manifest among type II than type I diabetics. There is also light evidence that periodontitis might be one risk factor in the incidence of type II diabetes (Demmer, Jacobs, & Desvarieux, 2008).

Whether diabetics have an increased risk of dental caries is not clear. Studies are highly controversial: some have found a higher occurrence of caries among diabetics than nondiabetics, while others show no difference between the two groups, and some studies have even found less caries among diabetics than nondiabetics (Sampaio, Mello, & Alves, 2011). A poor metabolic control has been found to be associated with a high rate of caries (Siudikiene, Maciulskiene & Nedzelskiene, 2005; Bakhshandeh et al., 2008; Miko et al., 2010). In another study, instead, metabolic control was not associated with dental caries, but it strengthened the positive association of mutans streptococci and lactobacilli with dental caries (Syrjälä et al., 2003). However, it is worth bearing in mind that poor metabolic control, salivary gland hypofunction,

Table 21.1 Mechanisms of Hyperglycemia Affecting Periodontal Disease at the Cell Level

Endothelial cells	Fibroblasts/ osteoblasts	Neutrofil monocytes	Osteoclasts
Permeability $\uparrow$ Adhesion molecules $\uparrow$	Apoptosis $\uparrow$ Collagen formation $\uparrow$ MMP formation $\uparrow$ Growth factor formation $\uparrow$	Phagocytosis $\uparrow$ Chemotaxis $\uparrow$ Cytokines $\uparrow$ Oxygen radicals $\uparrow$ MMP formation $\uparrow$ Delayed apoptosis $\uparrow$ Growth factor formation $\uparrow$ Influence on immune system $\uparrow$	RANKL-osteoprotegerin Synthesis $\uparrow$

MMP, matrix metalloproteinase.

and high crevicular fluid glucose concentrations may increase the risk of dental caries in diabetics. On the other hand, lower caries prevalence among diabetics has been explained by a sucrose-restricted diet and regular eating. Nowadays, though, diet is no longer as restricted as before because insulin can be administered more flexibly, and blood glucose can be monitored regularly.

Other oral diseases related to diabetes are xerostomia and fungal infections. Poor glycemic control can cause xerostomia, which increase the risk of candidiasis. Xerostomia can also change the protein composition of saliva and cause parotid swelling (Soell et al., 2007). An increased risk of oral mucosal lesions has also been observed, such as fissured tongue, median rhomboid glossitis, irritation fibromas, traumatic ulcers, oral leukoplakia, and lichen planus among diabetics. A link between diabetes and taste impairment and burning mouth syndrome has also been suggested. All in all, comprehensive evaluation of salivary function as well as detection and treatment of oral manifestations are important among diabetic patients.

Health Behavior

Oral Health Behavior

The main etiological factor for periodontal diseases is microbial dental plaque with a biofilm structure. It has been demonstrated that sustained, effective plaque control by the patients themselves is effective in preventing periodontal disease. This should include tooth brushing twice a day and interdental cleaning at least once a day. However, supragingival plaque control alone is not sufficient. It is also necessary to have a professional mechanically remove subgingival biofilm and dental calculus. In other words, it is essential to control plaque levels and ensure regular dental maintenance to prevent and treat periodontal diseases. It is also highly recommended that smoking stops when preventing and treating periodontal diseases.

As far as dental caries is concerned, microbial plaque and sugar in the diet are two major etiological factors. Therefore, toothbrushing twice a day with fluoride toothpaste and avoiding sugar are effective ways of preventing dental caries. Furthermore, the use of other fluoride and xylitol products is beneficial in preventing caries especially among high-risk individuals.

It has been found that diabetic patients are not particularly aware of the increased risk of oral diseases and that their attitude towards maintaining good oral health is poor (Eldarrat, 2011). Dental professionals should therefore ensure that diabetic patients are given proper information about the relationship between diabetes and oral health. It is also necessary to improve skills in performing oral hygiene practices because a higher incidence of plaque has been detected among diabetics than nondiabetics (Bridges et al., 1996; Sandberg et al., 2000; Arrieta-Blanco et al., 2003).

A number of studies have compared oral health behavior between diabetic and nondiabetic patients, but only a few have included all self-care practices, and also the criteria for good oral health behavior vary. There is also an abundance of descriptive studies on oral health behavior that include only diabetic patients. Comparisons between different studies are therefore difficult to make, but the results presented in Table 21.2 give a general idea of oral health behavior among diabetics compared to nondiabetic controls.

According to most of the studies, there are no major differences in oral self-care practices between diabetics and nondiabetics. Daily tooth brushing seems to be quite usual in both groups while brushing twice a day and daily interdental cleaning are irregular habits. There were differences in how regularly diabetics visit the dentist, though, showing more problems with attendance. It has been found that diabetics tend to miss dental appointments more often (Pohjamo et al., 1995) and require more emergency dental care (Thorstensson et al., 1989; Rahim-Williams et al., 2010) than nondiabetics. In addition, IDDM patients with poor metabolic

Table 21.2 Oral Health Behaviors among Diabetes Mellitus Patients Compared to Nondiabetic Controls

	DM	Control	DM	Control	DM	Control	DM	Control
Thorstensson et al. (1989)	152	77	88/75(t) s/l	89	46/31 (d) s/l	30	11/17 (irreg)	3
Jones et al. (1992)	309	706	94 (d)	83	–	–	61	45
Collin et al. (1998)	25	40	80 (d)	90	–	–	28% (a)	43
Moore et al. (2000)	390	202	72 (t)	80	33 (w)	30	69 (a)	76
Tomar and Lester (2000)	4570	101,148	–	–	–	–	65.8 (a)	73.1
Sandberg et al. (2001)	102	102	91 (d)	94	52 (d)	60	15 (irreg)	5
Alves et al. (2009)	55	55	34.5 (t)	21.8	30.9 (d)	18.2	63.8 (a)	48.7
Tagelsir et al. (2011)	52	50	44 (t)	48	–	–	75 (a)	86

s, short-term diabetes mellitus; l, long-term diabetes mellitus; d, daily; t, twice a day; w, weekly; a, at least annually/within the past 12 months; irreg, irregularly; reg, regularly.

control or diabetes-related complications visit the dentist less regularly than other diabetics (Karjalainen, Knuuttila, & von Dickhoff, 1994). It has been observed that while diabetics regularly visit the diabetes clinic, there were problems with the recommended dental treatment visits (Karikoski, Ilanne-Parikka, & Murtomaa, 2003).

Oral health information and demonstration of oral hygiene techniques should be included in diabetes self-management programs. Differences in content have been found between different education programs, with 10–15% of all programs not providing any oral health information and only 10% included a demonstration on oral hygiene techniques (Yuen et al., 2010). In conclusion, improved oral health behavior is needed among all of diabetics, and it should focus especially on patients with poor metabolic control and complications. Discussion about oral health behavior should be included as a part of other medical self-care issues and similarly also in connection of diabetes controls.

Diabetes Health Behavior

The purpose of daily self-care is to keep the level of blood glucose as close to normoglycemia as possible. Patients' self-care practices are indeed a crucial part in ensuring good metabolic control. Poor self-care causes poor long-term metabolic control, and this may predispose to the development of diabetic complications. These consist of microangiopathic complications, such as retinopathy and nephropathy, neuropathy, and a variety of macrovascular changes due to arteriosclerosis. This, in turn, increases the risk of stroke, myocardial infarction, and gangrenes. Periodontal disease has also been regarded as one of the complications of diabetes.

The Diabetes Control and Complications Trial Research Group (1993) has shown that optimal blood glucose control delays and prevents diabetic complications. Numerous studies have found that better adherence is associated with improved glycemic control and decreased healthcare resource utilization (Asche, LaFleur,

& Conner, 2011). It has been shown that infrequent attenders have more complications and poorer metabolic balance than regularly visiting patients (Griffin, 1998). The occurrence of missed diabetes control appointments varies considerably between studies, from 4% to 40%. Nevertheless, there is also evidence that appropriate self-care does not always guarantee a good metabolic balance, for example, due to differences in insulin absorption, insulin sensitivity, exercise, stress, food absorption, hormonal changes, illnesses, and traveling (American Diabetes Association, 1998a,b).

We recommend the article "Standards of Medical Care in Diabetes—2012" (American Diabetes Association, 2012) to the reader. It provides a comprehensive range of recommendations, including screening, diagnostic, and therapeutic actions for diabetics. Medical care should be organized by a physician-coordinated team, with an approach that assumes individuals with diabetes to take an active role in their self-care. Diabetes self-care practices consist of the following parts, which will be useful for dentists to know too:

- **Insulin therapy**
Type I diabetes: multiple-dose insulin injections three to four times per day or continuous subcutaneous insulin infusion. Insulin is matched to carbohydrate intake, premeal blood glucose, and anticipated activity.
Type II diabetes: initiation of oral agent therapy along with lifestyle interventions. Also insulin therapy is added into medication in some cases.
- **Assessment of glycemic control**
Self-monitoring by means of blood glucose is useful as a guide to management of diabetes. Interstitial glucose A₁C should be performed according to the treatment plan. For the majority of adult patients, a reasonable goal for A₁C is <7%.
- **Medical nutrition therapy**
The mix of carbohydrate, protein, and fat is adjusted to meet metabolic goals and individual preferences. Monitoring of carbohy-

drates is a key strategy in achieving glycemic control, and furthermore, alcohol use should be limited.

- **Physical activity and smoking cessation**
Diabetics are advised to perform regular aerobic physical activity. It is highly recommended that they stop smoking.
- **Regular foot care examinations**
Foot examinations should be performed annually, including inspection, assessment of foot pulses, and testing for loss of protective sensation.
- **Oral care**
Maintaining good oral health should be included in self-care practices. This means brushing teeth twice a day and daily interdental cleaning.
- **Regular controls**
Regular visits to diabetes care clinics as well as to dental care units are recommended. They should be based on individually determined check-up times. Based on the status of each patient's diabetes, their metabolic control is monitored, and any progression of possible complications is regulated. In terms of oral health, the oral status of the patients is carefully examined, including their periodontal status, and any early signs of periodontal disease is diagnosed.

There are various terms to describe patients' own treatment practices. The term "self-management" emphasizes the responsibility of the patient, while "adherence" is defined as the level at which patients follow the regimens established by patient and healthcare professionals. "Compliance," in turn, means only strict observance of instructions. "Self-care" can be either strict adherence to regimens or active self-care. Active self-care means self-monitoring, dietary, and insulin adjustments for daily purposes and regular exercise.

Each patient should have their own management plan and be provided with adequate advice on how to perform it. Diabetes self-management education and ongoing diabetes support are an integral part of diabetes care.

There are recommendations concerning diabetes self-management education (DSME) (American Diabetes Association, 2012).

- People with diabetes should receive DSME according to national standards and diabetes self-management support when their diabetes is diagnosed and as needed thereafter.
- Effective self-management and quality of life are the key outcomes of DSME and should be measured and monitored as part of care.
- DSME should address psychosocial issues, since emotional well-being is associated with positive diabetes outcomes.
- Because DSME can result in cost-savings and improved outcomes, DSME should be adequately reimbursed by third-party payers.

Diabetes self-management education is an essential element in diabetes care. It helps patients to cope when diabetes is diagnosed and ongoing DSME ensures effective self-management throughout the patient's lifetime. The goals in self-management are that diabetics can optimize metabolic control, prevent, and manage complications and secure a quality of life that is as good as possible in a cost-effective manner (Mulcany et al., 2003). The patient's own attitudes, beliefs, knowledge, and adherence to diabetes treatment may influence diabetes self-management. For example, cultural attitudes, financial resources, comorbidities, and social support, as well as the clinician's attitude, beliefs, and knowledge about diabetes all impact self-management (Nam et al., 2011).

There are many reasons for inadequate diabetes self-care. Self-care is complex, requires commitment, and specific lifestyle changes. Factors such as beliefs about the benefits, the reliability of regimens, stress, lack of time and support, being away from home, living alone, and fear of hypoglycemia all affect diabetes self-care. It has been observed that knowledge, social demands, personal preferences, and obstacles at home or while shopping affect diet adherence in particular. Factors associated with diabetics' nonattendance at healthcare appoint-

ments consist of the patients' health beliefs and attitudes, the organization of the clinic, the costs of attendance, and the degree of patient participation. All in all, healthcare professionals should be aware of possible psychological barriers when setting treatment goals and developing plans to reach them.

Numerous studies exist concerning different interventions and individual patient education for improving adherence to treatment recommendations. However, efforts to improve adherence do not show significant effects, and there is no significant difference between individual counseling and ordinary care. Some intervention studies reported an improvement in behaviors, but according to two Cochrane databases, the effect on metabolic control was not impressive (Vermeire et al., 2005; Duke, Colagiuri, & Colagiuri, 2009). Further studies are needed to find effective methods and models to improve patient adherence, which is crucial in preventing complications.

Health Behavior Models

Various complementary theoretical models have been used both to explain health behaviors and also to develop education programs aimed at changing patient behavior. It would be useful to know if good diabetes self-management is associated with good dental self-care or whether the two are independent of one another.

The self-efficacy framework (Bandura, 1977) is widely accepted as a motivational factor, and it has been shown to be important in the self-management of both diabetes and oral health. Self-efficacy is a behavior-specific feature that plays a major role in the process of behavioral change. The level of self-efficacy has a bearing on the effort applied to behavior and impacts the individual's ability to persist in the task in face of obstacles or failure (Bandura, 1977). In short, various studies have found that the perception of self-efficacy is a significant psychological feature affecting health behaviors, also showing overlapping relations between diabetes and oral health behaviors (Knecht et al.,

1999; Syrjälä, Knecht, & Knuuttila, 1999; Serrano et al., 2011), and self-efficacy has been shown to relate to the patient's health status in other areas too (Knecht et al., 1999). It has been concluded that the assessment of self-efficacy of patients should be the first step in the development of individual interventions (Mishali, Omer, & Heymann, 2011).

Other well-known theoretical models are also used in health behavior studies. Self-esteem (Rosenberg, 1965) is seemed to be important for good motivation and self-confidence. Self-esteem is defined as a personal, subjective judgment of worthiness, which is expressed in one's attitudes toward oneself. According to Weiner's attribution theory (Weiner, 1985), most people assign causes to their success or failure. Having an explanation for events gives people the feeling they are in control of their own lives. The locus of control theory divides people into those who have an internal locus of control and those who have an external one. The former are people who interpret events as being dependent on their own behavior or on stable characteristics, while the latter are ones who believe that events are in some way contingent on luck, fate, chance, or the influence of other powerful persons (Rotter, 1984). Ajzen and Fishbein's theory of reasoned action proposes that individuals are more likely to intend to perform a behavior if they hold favorable attitudes toward performing the behavior (Ajzen & Fishbein, 1980). Using all these theoretical models in the same diabetic study population, it was found that self-efficacy is the best overall determinant of various health behavior practices (Syrjälä et al., 2004).

Unidimensionality of health behaviors implies that an individual who adheres to good health practice concerning their health behavior will probably act similarly toward other health behaviors, too. By contrast, the concept of multidimensionality means that some health behaviors occur together while others are independent (Patterson, Haines, & Popkin, 1994). The results of health behavior studies give an insight into possible unidimensionality between oral and

diabetes health behaviors, but the findings are not consistent. A similarity between the two health behaviors can be detected among some individuals, but the two can also be distinct behaviors. On the whole, health education should be based on identifying and enhancing the psychological features affecting patients' health behavior.

Besides the willingness to adapt to change and being provided with appropriate education to achieve behavioral change, confidence in having the necessary skills and support are important factors in behavioral change programs. Examples on how psychological interventions in general populations have been used to improve adherence to oral hygiene instructions are available in the Cochrane review (Renz et al., 2007). The review observes, however, that higher quality and greater methodological rigor in the trials will be needed in the future. It is also important to include the counseling of diabetics more comprehensively in the study curricula of dental students. To better encourage students and faculty members to provide diabetes counseling, they need to believe that the overall health of diabetes patients can be improved by offering them instruction on how to treat diabetes. In addition, competence and self-efficacy related diabetes education need to be improved among both students and faculty members (Fischer & Koerber, 2011).

Diabetics as Dental Patients

When a dental patient is a diabetic, the dentist should check both the past and present diabetes status of the patient. It is also useful to collaborate with other healthcare professionals to ensure a sufficiently comprehensive view of the patient's self-management level. This should be taken into consideration when planning dental care. In order to be able to have an impact on the behavioral aspects of the diabetic's self-care practices, it is imperative that the whole dental appointment situation is safe and remains confidential. Doctor-patient relationships require continuity. This section of the chapter provides

tools for assessing and preventing medical risks in diabetics when dental treatment is being carried out.

Emergency Situations

Diabetes-related emergencies are hypo- and hyperglycemia. Hypoglycemia is an acute, rapidly progressive life-threatening condition mainly among insulin-dependent diabetics. It results from insulin overdosage or lack of food intake. A variety of symptoms exist, such as problems with conversation, incoherence, lethargy, uncooperativeness, mood changes, hunger, nausea, sweating, tachycardia, stomach symptoms, and cold and wet skin. Without treatment, the patient loses consciousness and experiences seizures. Hyperglycemia, instead, is not acutely life-threatening. It is caused by neglect of insulin therapy or by a greater need for insulin. Symptoms include thirst, hunger, and urination with significant weight loss a couple of days before a hyperglycemic emergency. Other symptoms are itching, fatigue, headache, abdominal pain, nausea, vomiting, and mental stupor. After a longer period of hyperglycemia, physical weakness, acetone breath, hot dry skin, and a bright red face can develop. Respiration becomes deep and rapid, and the patient has tachycardia and hypotension. Eventually, hyperglycemia can lead to diabetic coma (Nunn, 2000).

The main difference is that a hypoglycemic person has cold and wet skin and manifests bizarre behavior while a hyperglycemic patient has a hot and dry appearance and acetone breath. Until an exact diagnosis has been made, the patient should be treated as a hypoglycemic patient, because hypoglycemia can rapidly cause unconsciousness. Oral carbohydrates (sugared drink, honey, etc.) are given to well cooperating patients. If the patient has an insulin pump and the diagnosis is not clear, the pump should be turned to suspend mode. Emergency services should be summoned if the patient loses consciousness or recovery does not take place. A subcutaneous glucagons injection and/or parental carbohydrate is administered

to unconscious hypoglycemic patients. Above all, where diabetic patients are given dental treatment, there should also be proper tools for emergency situations; in other words, at least glucometers and oral carbohydrates. Moreover, general information on further emergency measures should be available.

Special Features of Treatment

The American Society of Anesthesiology (ASA) has developed a physical status classification system which also deals with diabetics (Malamad, 2000). Patients with well-controlled diabetes bear minimal risk during treatment, whereas patients with uncontrolled diabetes are subject to significant medical risk during treatment. These patients should therefore not be given dental treatment until their diabetes is under control. Each patient must be evaluated by the type of medication and level of metabolic control.

Diabetic hypoglycemia can be prevented by discussing the patient's insulin intake before dental treatment. The best time for a dental appointment depends on the type of insulin (administration method, onset, peak time, duration of action). The best way is to adhere to the patient's individual life routines when scheduling dental appointments. Diabetic patients should also bring their own glucometers with them and take blood glucose before treatment.

Diet control, blood sugar control, antibiotics, and stress reduction have to be addressed separately with each patient. Dental treatment can be a stressful situation and thus can increase the need for insulin. Stress reduction by pain control, premedication, and analgesia is therefore essential. In every case, appointments should be as efficient as possible. Among well- and moderately well-controlled diabetes patients, prophylactic antibiotic is prescribed only when it would be prescribed to a nondiabetic patient. By contrast, antibiotic coverage should be considered among uncontrolled diabetes patients. Poorly controlled patients are advised to improve their control of blood

glucose before surgery if it is possible to wait. After a stressful dental treatment, the patient's blood glucose level should be checked at least four times a day for several days (Malamad, 2000).

Conclusions

Collaboration

As a dental practitioner, make an effort to forge collaboration between diabetic patients and other healthcare professionals. Medical professionals should share the responsibility for good health behavior in oral and diabetes care. It is important to offer information and instruction on dental issues to nurses who are specialized in treating diabetics.

Bidirectional Relationship between Diabetes and Periodontal Infection

Be aware of the two-way relationship between dental health and diabetes: periodontitis as a chronic infection might have a negative impact on metabolic control, and thus in the long term, it might influence progression of complications. On the other hand, poorly controlled diabetes and diabetic complications increase the risk of periodontal infections. Periodontal therapy of poorly controlled diabetics can result in a modest improvement of glycemic control. The dentist might be able to detect an undiagnosed type II diabetes while treating periodontal patients with abnormal responses to plaque, delayed wound healing, and lack of resolution of disease after conventional treatment.

Prevention and Early Diagnosis of Oral Diseases

Frequent dental visits are highly recommended for diabetic patients. For patients with poor metabolic control, diabetic complications, or reduced salivary gland function, dental visits about every three months may be advisable. Dentists should also be able to identify and

provide proper treatment for different oral manifestations, such as xerostomia. Dentists play an important role in counseling patients on dietary factors and in motivating patients to stop smoking. Prevention and early diagnosis of periodontal diseases are important goals in dental professional care especially among diabetic patients. Improved oral hygiene is significant for all diabetics, but should be stressed particularly to patients with poor metabolic balance and complications. Other special groups are children and adolescents.

Knowledge of Diabetes as a Part of Effective Elimination of Oral Infections

The goal of treatment is to eliminate periodontal infection in the long term so as to minimize the risks to general health. The dentist should be aware of the patient's self-management level, long-term blood glucose level, and existence and severity of diabetic complications. Dental health professionals should also have the competence to interpret this information and obtain further information by consultations.

Special Features of Treatment

When treating a diabetic as dental patient, determine the medical risks relating to the dental appointment. Ensure that there are proper tools for emergency situations, and at least glucometers and oral carbohydrates should be available. Find out about emergency organization in advance. Be aware of the patient's sensitiveness to infections, especially among poorly controlled diabetics, by providing sterile and antitraumatic dental treatment and by using prophylactic antibiotics.

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22

Oral Health Promotion with People with Special Needs

Paul Glassman

Key points

- Preventing dental diseases in people with special needs requires considerations and strategies beyond those required for other individuals.
- Oral health professionals need to communicate with and work with caregivers instead of the individual in many circumstances. This may require understanding and working with the residential facility where the individual lives and one or more organizations responsible for providing medical and social services for the individual.
- People with special needs can face informational, physical, behavioral, and organizational barriers to having good oral health. Oral health professionals who understand how to address these barriers can make a difference in the oral health of the most vulnerable and underserved members of our society.

Introduction

The changing demographics of our population, along with advances in medical and social systems, have resulted in a number of people with special needs who need oral health services rising dramatically (U.S. Department of Health and Human Services, 2000; United States General Accounting Office, 2000; Glassman & Miller, 2006; Glassman & Subar, 2009; IOM and NRC, 2011). In this context, people with special needs refers to those individuals who have barriers to achieving good oral health primarily because of a disability or medical condition. This includes people who are elderly, people who have disabilities, and those who may also have complex medical, physical, and psychological problems.

People with special needs have more dental disease, more missing teeth, and more difficulty obtaining dental care than other segments of the population (Oral Health America, May 2000; Waldman, Perlman, & Swerdloff, 2000; Waldman, Rader, & Perlman, 2009). It is harder for people with special needs to find sources of dental care, and once a source of care is located, it can be more difficult to render dental treatment. Deciding on adequate treatment may require balancing complex medical and social factors and may sometimes require the use of sedative medications or even hospital treatment under general anesthesia. Many people with special needs are dependent on others to locate and arrange for dental treatment. Some caregivers are not themselves aware of the consequences of untreated dental disease and may not be aware of or use procedures known to prevent dental diseases. These factors can result in pain, suffering, and social stigma in these populations beyond that found in other segments of our society (Horwitz, 2000; Schriver, 2001).

It is clear that it is far better to prevent dental disease in people with special needs rather than attempt to treat disease that has already developed, as it is in all populations. However, the difficulty providing treatment for people with

special needs makes this focus on prevention even more imperative in this population.

Even with a focus on prevention, there are challenges with establishing effective preventive practices in people with special needs. As indicated previously, many people in these groups are dependent on caregivers to perform preventive practices. Additional challenges may come from the presence of xerostomia, which is a side effect of many psychotropic and other medications used by people in this group. Some people and their caregivers may not understand how to prevent dental disease. Some people have physical problems that make it difficult for them to perform preventive procedures. Some people are resistant to performing these procedures. All these obstacles present challenges to maintaining dental health not experienced by most individuals in our society.

Overcoming Obstacles to Oral Health

Many people have developed techniques and programs to prevent dental disease in people with special needs (Glassman et al., 1994; Miller et al., 1998; CDC, 2001). The training package *Overcoming Obstacles to Oral Health: A Training Program for Caregivers of People with Disabilities and Frail Elders* is currently in its 5th edition (Glassman et al., 2011). It is designed for caregivers of people with disabilities and is organized to address four primary barriers:

- Information obstacles: Does the individual or their caregivers understand what needs to be done?
- Physical obstacles: Can the individual or their caregivers physically perform needed procedures?
- Behavioral obstacles: Is the individual resistant to performing or having someone else perform preventive procedures?
- Organizational obstacles: Is there a system in the home, community, or facility where the individual resides that can support and help

them and their caregivers overcome the other three obstacles?

These materials are available in a package with a CD and DVD which include workbooks and administrators and trainer's manuals, training videos, Powerpoint presentations, pre- and posttests, and other resources. There is an emphasis on developing an individual oral health plan for each individual.

Overcoming Information Obstacles

Given the fact that people with special needs can be dependent upon a caregiver to carry out preventive practices, it is critical that the caregiver as well as the individual understand the causes of dental diseases and techniques for prevention. It is unlikely that a caregiver will do more for the individual they are caring for than they will do for themselves. Therefore, caregivers must understand the importance and benefits of oral preventive practices as well as the techniques to accomplish them. It is important to start with an assessment of the knowledge and skills of the caregiver and the individual. When making such an assessment, it is important to consider the setting and strategies for assessing their level of knowledge and conveying new information. Issues such as socioeconomic status, race, ethnicity, age, gender, native language, cultural beliefs, how the individual best receives health information, and the best setting for delivering information are important to understand and incorporate in any group or individual oral health literacy assessment or improvement efforts (IOM and NRC, 2011). In many circumstances, providing the traditional short lesson on "oral hygiene" or even a longer "anticipatory guidance" session delivered at the end of a dental appointment in a dental office may not have any impact on the subsequent behavior of the individual or their caregivers (Glassman & Miller, 2006; American Academy of Pediatric Dentistry, 2008; American Academy

of Pediatric Dentistry, 2009). For some individuals, effective health promotion messages may best be delivered in a community setting, such as the individual's residence, a school, a work program, or a location where they receive other social or general health services. It is critical that oral health professionals who work in dental offices and clinics recognize the limitations of delivering oral health messages in the dental office setting and the value of partnering with community-based resources.

Effective preventive information can be delivered in a "pyramid" training program where the dental professional trains a home health nurse or a residential facility manager or someone else who can then be responsible for training others in the techniques learned. Such a training program can greatly magnify the effectiveness of the dental professional. The *Overcoming Obstacles* training materials are designed to be used in this "pyramid" training approach.

When discussing "daily mouth care," the term preferred by the author, it is important to use simple language, referring to pictures and simple diagrams whenever possible, delivering small amounts of information at any one time, testing understanding, repeating information and adding new information at subsequent sessions, and creating an environment where individuals or caregivers feel comfortable asking questions. It is also important to tailor messages to the values and desires of the person you are talking to. For example, *motivational interviewing* is a technique for understanding the beliefs and values of the individual and customizing oral health strategies to help the individual achieve their own goals. This method has been shown to result in greater improvement in oral health than traditional health education (Weinstein, Harrison, & Benton, 2006).

It is also critical to understand that no matter how well delivered the message, it may not translate into behavior change (Freeman & Ismail, 2009; Satur et al., 2010). A 2000 report by the Institute of Medicine on social and behavioral research stated that "To prevent disease,

we increasingly ask people to do things that they have not done previously, to stop doing things they have been doing for years, and to do more of some things and less of other things. Although there certainly are examples of successful programs to change behavior, it is clear that behavior change is a difficult and complex challenge. It is unreasonable to expect that people will change their behavior easily when so many forces in the social, cultural, and physical environment conspire against such change" (IOM, 2000). In fact, in a study published in 2006, Glassman and Miller demonstrated that caregiver knowledge about preventive procedures was improved after training, but this was only translated into behavior change with incorporation of new techniques into daily routines after a dental assistant observed the prevention session in the residential environment and provided hands-on, real-time coaching (Glassman & Miller, 2006).

Other information needs include assessing the individuals risk for future dental disease using a method such as the *Caries Management by Risk Assessment* (CAMBRA) model (Young, Featherstone, & Roth, 2007) and the need for medical management (Glassman & Miller, 2003; Glassman et al., 2003).

Overcoming Physical Obstacles

Another barrier to prevention of dental disease is physical barriers. Some people understand what needs to be done, but lack the musculature, dexterity, or coordination to do it. For many people, the physical barrier is simply the inability to grasp a toothbrush or to manipulate dental floss. There are numerous adaptations and aids that can help overcome these physical barriers. Figure 22.1 shows toothbrushes that have been adapted with a larger handle using a tennis ball or bicycle handle grip. Figure 22.2 shows someone with limited dexterity using a large foam ball as a means of picking up a toothbrush. Similar adaptation can be made for floss holders. These adapted instruments

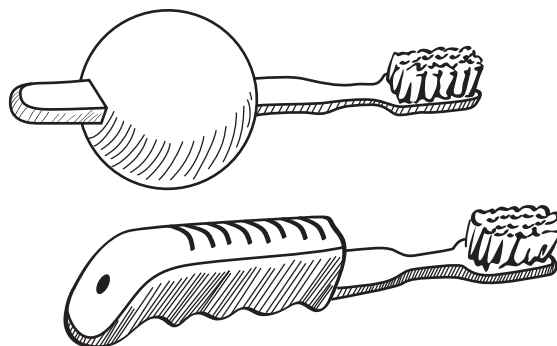


Fig. 22.1 Toothbrushes adapted for easier grip. © 1998 University of the Pacific School of Dentistry. Reprinted with permission.

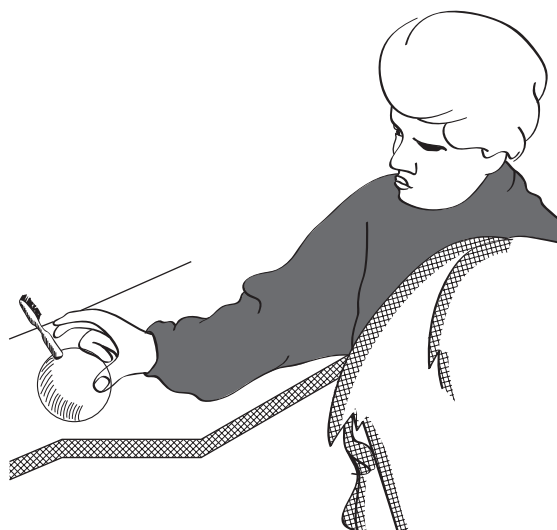


Fig. 22.2 Adapted toothbrush for someone with limited dexterity. © 1998 University of the Pacific School of Dentistry. Reprinted with permission.

can be much easier to grip than conventional implements.

People with special needs should be encouraged to do as much as possible for themselves. However, some people need help from caregivers in order to perform oral hygiene procedures. This situation where the person does as much as they can and the caregiver does what the person cannot do is referred to as "partial par-

ticipation.” For some individuals, the caregiver needs to do much of the work. There are several positioning techniques that can make it easier for a caregiver to help someone complete oral hygiene procedures. Figure 22.3 is an illustration of a “tongue blade mouth prop.” This type of mouth prop can be easily constructed by a caregiver from readily available materials and can be very useful in helping someone complete oral hygiene procedures. Figure 22.4 shows the use of a tongue blade mouth prop with someone who is sitting on the floor with their head resting on the caregiver’s shoulders. Note the use of the forefingers of the left and right hand in stabilizing the head. Figure 22.5 again shows the use of a tongue blade mouth prop. This time the individual may be less able to help and is positioned on a couch. Note the use of the right forearm and the tongue blade in stabilizing the head. These positions allow the caregiver to see and gain access to parts of the mouth that would be difficult in other positions. Again, dental professionals can play a pivotal role in educating caregivers about the use of physical adaptations and partial participation.

These “partial participation” techniques can be useful when teaching a caregiver how to perform “daily mouth care.” For example, many caregivers try to brush someone’s teeth or perform other procedures while standing

behind them in the bathroom. In this position, they have difficulty seeing, have to stop frequently to allow the individual to spit, and generally cannot effectively perform the needed procedures. It is useful to realize that although most people remove plaque and apply fluoride in the form of fluoride toothpaste at the same time, it is not necessary to do it that way. If the caregiver will first remove plaque with only a damp toothbrush and then later apply fluoride toothpaste, they will have increased freedom to perform mouth care activities outside of the bathroom in a location where they can see and be effective.

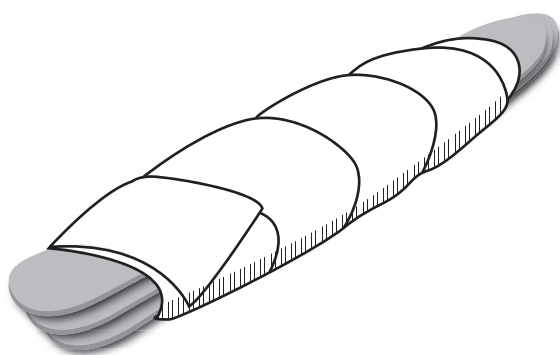


Fig. 22.3 A tongue blade mouth prop. © 1998 University of the Pacific School of Dentistry. Reprinted with permission.



Fig. 22.4 Partial participation—using positioning and a tongue blade mouth prop. © 1998 University of the Pacific School of Dentistry. Reprinted with permission.



Fig. 22.5 Partial participation—using positioning and a tongue blade mouth prop. © 1998 University of the Pacific School of Dentistry. Reprinted with permission.

Oral health professionals have an important role in teaching caregivers who are helping someone complete daily mouth care procedures how to position the person and themselves so they can have the best visibility possible and be able to perform the needed procedures as thoroughly and easily as possible.

Overcoming Behavioral Obstacles

Some people or their caregivers may understand what needs to be done and possess the manual dexterity to do it, but the individual is resistant to participating in oral hygiene procedures or to letting the caregiver help. There are a number of techniques that can be used to overcome these behavioral barriers that are discussed in the *Overcoming Obstacles* training materials. Typically, the role of the dental professional is to work with the caregiver to educate the caregiver about the use of behavioral intervention strategies. Most dental professionals

will not be able to be with the individual over the sometimes extended time that a behavioral intervention program can take. There are numerous guidelines and techniques that are available to help caregivers work with such individuals, reduce resistive behaviors, and gain cooperation (American Academy of Pediatric Dentistry, 2008; Lyons, 2009). Earlier terminology referred to “behavior management” techniques. This terminology is now being replaced by terminology like “behavior support.” Although the guidelines just referenced and many others like them are written for a professional audience, there are simple principles that can be taught to caregivers and adapted for individual situations.

One technique is referred to as “structuring the environment.” This refers to picking a place or time of day that is more conducive to gaining cooperation than other times or places. It may be a place or time where there are minimal distractions. It might include performing oral hygiene procedures in a setting that does not associate it with other unpleasant activities or people, or even better, makes oral hygiene procedures seem fun. In order to structure the environment for a given individual, it is necessary to get to know that individual and determine what type of environment would be conducive to a pleasant oral hygiene session. Caregivers may need to be trained to pay attention to how the individual responds in various environments or with various people present in order to make this determination.

Another technique is called “involving the individual.” Many people with special needs, especially in group living or institutional living arrangements may have very regimented lives. They may be told when to wake up, when to eat, when to use the bathroom, what to wear, and what they will do during the day. They can be most appreciative of anything that a caregiver can do to increase choices, and this in turn can aid cooperation. Increasing choices can be as simple as being able to choose when to brush one’s teeth or what color a new toothbrush will be. It also involves counseling the

caregiver to pay attention to how the person is doing and not to push them so far so that a pleasant oral hygiene session turns into an unpleasant one.

A basic behavioral intervention is the use of reinforcers or reward systems: determining and using reinforcers can be a critical component of a behavioral intervention plan for someone who is resistant to participating in oral health improvement procedures. A reinforcer is something that will result in having the individual want to continue or increase the activity that produced the reward. Caregivers can be educated to realize that carefully applied rewards can motivate people to become more and more independent in oral hygiene practices. As with the other behavioral interventions, it is critical that the caregiver pay attention to the individual and what they respond to in order to determine what reward may be reinforcing for them. It is important that the caregiver use things that are actually rewarding for that individual at that given time and to monitor the effect of the reward over time and change it if necessary. Caregivers can be educated to realize that social rewards like smiling and praise can be as powerful for people with special needs as they can be for everyone else.

Once caregivers have mastered the idea of selecting and applying rewards, they can be educated to use shaping procedures. They will need to understand that shaping is the reinforcement of an approximation of the task. If they would like someone to brush for 5 minutes, they might use a reinforcer after 30 seconds at first. Later, the reinforcer might not be used until 1 or 2 minutes have passed. The caregivers must realize how critical it is to make sure that each session is a pleasant one and ends with the individual having a good feeling about themselves and their oral health. This can take coaching from the dental professional and practice on the part of the caregiver.

Caregivers can also learn about the idea of “generalization.” For instance, they may be able to work with the individual to learn that it is ok to have someone put a tongue blade in their

mouth to look inside. Later, this may make it easier for the individual to accept help with toothbrushing.

With any of the behavioral intervention techniques described earlier, simple and direct communication is important. Some people have trouble hearing or seeing well or may not understand verbal communication very well. Some simple and direct techniques that caregivers can use to improve communication include the following:

- Establish eye contact.
- Use simple declarative sentences.
- Use words and phrases that are perceived as helping not giving orders.
- Speak in a calm but friendly and firm voice using the individual's name frequently.
- Give one instruction at a time.
- Offer choices whenever possible.

The behavioral interventions described previously can be critical for caregivers to master if they are to improve oral health for someone who is resistive to oral hygiene practices. Dental professionals can have an important role in educating caregivers about these behavioral interventions. More information about the techniques described earlier can be found in the *Overcoming Obstacles to Dental Health* training materials.

Overcoming Organizational Obstacles

Many people with disabilities live or spend time in group settings. These settings can include residential care facilities, day programs, or institutions that provide some level of health care or social services (Glassman & Subar, 2010). In these settings, there are often organizational policies and structures that impact how daily mouth care activities are performed. These institutional settings provide an opportunity to incorporate effective daily mouth care and preventive procedures. Oral health professionals can significantly improve oral health of indi-

viduals living in these group settings by working with the leaders of the facility to establish an oral health program (Glassman et al., 2011). Some characteristics of an effective oral health program are

- Oral health becomes incorporated into the mission of the facility so everyone knows that maintaining oral health for the residents of the facility is a core value and practice.
- The top leaders in the facility communicate to everyone associated with the facility that oral health is important and good oral health is an expectation for all residents.
- The top leaders in the facility help communicate the importance and benefits for everyone in the facility of the residents having good oral health.
- Training, coaching, and mentoring for direct care staff is provided to help them perform effective daily mouth care for the facility's residents.
- There is a system for supervision, monitoring, and rewarding direct care staff to ensure that they perform effective daily mouth care for the facility's residents.
- There is a system for purchasing, inventorying, and providing mouth care products that are needed as a part of the oral health program.

Working with, training, and supporting leaders in residential facilities may not be the usual techniques that oral health professionals use in an office-based practice. Oral health professionals may need to expand their vision of their professional role and responsibility to take on this type of activity. However, those who do this will be rewarded by seeing their patients improve their ability to maintain their oral health and require fewer complex dental procedures.

Putting It All Together

It is important to have a plan for applying the various techniques described in this chapter. In many circumstances, this plan will need to be

communicated among a variety of people. Some people with special needs, particularly those in group and institutional living situations, have numerous caregivers who may be helping them maintain oral health. It is critical that these caregivers understand the strategy being employed for those individuals and coordinate their efforts. It is also helpful, even when the caregiver is a parent of an individual living in a family home to have a specific plan for maintaining oral health. Figure 22.6 is an example of such a plan. This Daily Mouth Care Plan is a part of the *Overcoming Obstacles to Dental Health* training package.

There are several advantages to using a planning and communication document such as the one in Figure 22.6. First, it serves to help caregivers organize their thinking about the treatment and preventive measures that are to be used for a particular individual. It helps them to think about specific interventions and measures that address the specific needs of that individual. Second, it acts as a communication vehicle so multiple caregivers can be kept up to date about the current strategies being used. Finally, it acts as a record of progress. If it is periodically updated, then caregivers can look back at old plans to review progress and use the sections of the current plan that act as reminders of future appointments or interventions.

Conclusions

People with special needs have the most dental disease and the least access to treatment services of any segment of our population. Therefore, it is critical that everything possible be done to prevent the occurrence of dental disease in these individuals. This chapter has reviewed strategies for overcoming informational, physical, behavioral, and organizational barriers to maintaining oral health. These strategies and protocols are designed to compliment a system of supported community-based oral health care. The goal of this system is to help people with special needs enjoy a lifetime of oral health

(a)

OVERCOMING OBSTACLES TO ORAL HEALTH						
Daily Mouth Care Plan (5/11/10)						
Name _____			Date _____			
A S S E S S M E N T						
Describe current daily mouth care plan (Natural Teeth & Dentures) Dentures ☐ Y ☐ N Daily Tooth/Denture brushing ☐ 1x ☐ 2x ☐ 3x Brushes Own Teeth/Dentures ☐ Y ☐ N If yes, for how much time? _____ Daily flossing ☐ Y ☐ N Daily mouth rinse ☐ Y ☐ N Dentures stored ☐ Wet ☐ Dry Physical challenges to mouth care ☐ Y ☐ N Describe: _____ _____ _____ _____ Behavioral challenges to mouth care ☐ Y ☐ N Describe: _____ _____ _____ _____						
CREATE - A - PLAN: TOOLS AND PRODUCTS						
TOOLS			PRODUCTS			
B R O U S H E S	☐ Electric ☐ Adapted ☐ Two-sided ☐ Standard ☐ Denture TB	☐ 1x/day ☐ 2x/day ☐ 3x/day	Products Xylitol: ☐ Mints ☐ Rinse*(can use swab) ☐ Spray ☐ Gum ☐ Fluoride Rinse* (can use a swab)	Use 3x/ day 2x/ day 2-3x day	Medications ☐ Chlorhexidine ☐ Fluoride varnish ☐ High Concentration Fluoride Toothpaste ☐ MI Paste	Use 7 days out of each month 4 x/year At least 1x/day
B E T W E E N	☐ Inter-proximal brush ☐ Adapted floss holder ☐ Super floss ☐ Standard floss	☐ 1x/day ☐ 2x/day ☐ 3x/day	Fluoride Toothpaste ☐ Standard ☐ Sensitive ☐ Denture cleaner			
A I D S	☐ Mouth prop ☐ Perio-aid ☐ Rubber tip stimulator ☐ Disclosing tablets	☐ 1x/day ☐ 2x/day ☐ 3x/day	Dry Mouth Products ☐ Gel ☐ Spray ☐ Rinse *(can use swab) ☐ Toothpaste ☐ Baking Soda	At least 1x/ day	☐ Other _____	

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Fig. 22.6 (a and b) The Daily Health Care Plan. © 1998 University of the Pacific School of Dentistry. Reprinted with permission.

(b)

OVERCOMING OBSTACLES TO ORAL HEALTH Daily Mouth Care Plan (5/11/10)					
CREATE -A- PLAN: PHYSICAL/BEHAVIOR PLAN					
Level of Participation ☐ Full participation- Person independent ☐ Partial Participation- Can complete some tasks ☐ None- Person completely dependent			Prompts to use: ☐ Physical (hand-over-hand) ☐ Pointing ☐ Physical (touch) ☐ Verbal		
C R E A T I N G C O N D I T I O N S F O R S U C C E S S	Person	Who will work with individual?	☐ Caregiver	☐ CNA	☐ Family Member
	Place	Best position	☐ Bedside ☐ Couch	☐ Wheel -chair ☐ Recliner	☐ Bean bag chair ☐ Other _____
	Time	Best time of day	AM _____	PM _____	Other _____
I N V O L V I E D U T A H L E	List Choices offered: (Ex. Do you prefer the couch or bedside? Which flavor toothpaste?) A. _____ B. _____ C. _____		Desensitization: Use gradual introduction (Ex. Start with the person holding a hair brush, then a toothbrush, then hold the toothbrush to the lips.) Steps being worked on: 1. _____ 2. _____ 3. _____		
	Limit Setting by individual: (Ex. I can brush the top teeth for 20 seconds, then you take over.) A. _____ B. _____ C. _____		Shaping: Use rewards when a task is completed in the direction of a goal. (Ex. As the person completes each task, expect more from the next task before the reward is given.) Steps being worked on: 1. _____ 2. _____ 3. _____		
	List Rewards offered: (Ex. Keep rewards healthy- a TV show, xylitol mints, music, book) A. _____ B. _____ C. _____				
PROFESSIONAL DENTAL CARE PLAN					
Last dental cleaning appointment: Date _____ Next appointment date: _____ Dental Check-up recommended every: ____ Months Type of dental setting: ☐ Dental office—no special considerations ☐ Dental office (check one)— ☐ No special support, ☐ oral/conscious/deep sedation ☐ behavior/physical supports ☐ Hospital or Surgi-center ☐ Will not tolerate any of the above settings(RDHAP) Dental Provider Name: _____ PH: _____ Address: _____ Email: _____					

Fig. 22.6 Continued

the same as other members of our society. Finally, a planning process using a Daily Mouth Care Plan has been described as a means of planning, communicating, and tracking strategies to improve oral health for people with special needs.

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23

The Use of Humor in Pediatric Dentistry

Ari Kupietzky and Joseph Shapira

Key points

- The use of humor in pediatric dentistry is highly recommended.
- It may be used to facilitate communication with patients and parents.
- Humor may alleviate patient anxiety and assist the dentist in coping with stress associated with the practice of dentistry.
- Development of humor in the child is described.
- Practical suggestions for application of humor in daily pediatric dental practice are presented.

For many years, studies have suggested that dentistry generates more stress than any other profession, primarily because of the nature and working conditions of the dental practice (Bodner, 2008). It is recognized that dentistry is a stressful profession in general, and in particular, the specialty of pediatric dentistry can be all

the more stressful. Crying children, overprotective and sometimes outright hostile parents, coupled with a child's small mouth and teeth all contribute to a stressful environment. The introduction of humor into the daily practice of pediatric dentistry may have a compounding double effect by alleviating the stressed patient

and at the same time allowing the dentist to cope on a daily basis with the stress faced everyday while treating young dental patients. The use of humor for the management of both children patients and their involved parents will be discussed in this chapter.

While some might consider humor's playful role trivial, findings point to its critical role in building and maintaining relationships, emotional health, and cognitive function (Martin, 2007). Pediatric dentists anecdotally have long recognized the presence of humor in their practice; yet planned humor assessment and interventions are relatively recent considerations in medicine/dental care. Humor has positive effects on both a person's physiology and psyche. Laughter signifies positive things to people; it may add to feelings of togetherness, closeness, and friendliness. The use of humor is an indication of mental well-being. It minimizes the effect of negative factors and protects from difficulties. An understanding of humor development and associated activities will assist pediatric dentists to (a) anticipate the various types of humor unique to each stage of childhood, (b) develop individualized humor interventions, and (c) evaluate the outcomes of these humor interventions (Dowling, 2002).

Definitions

Prior to further discussion, a synopsis of common theories and definitions of humor are in order. A full discourse on humor theory is beyond the scope of this review, but certain basic definitions are essential. From a psychological perspective, humor involves cognitive, emotional, behavioral, psycho-physiological, and social aspects (Mora-Ripoll, 2010). In general, the term humor can refer to a stimulus, which is intended to produce a humorous response (such as a humorous video), a mental process (perception of amusing incongruities), or a response (laughter, exhilaration). Laughter is the most common expression of humorous experience. Humor and laughter are also typi-

cally associated with a pleasant emotional state. For the purpose of this discussion, *humor* is defined as a stimulus that helps people laugh and feel happy. *Laughter* is a psychophysiological response to humor that involves both characteristic physiological reactions and positive psychological shifts. *Sense of humor* is a psychological trait that varies considerably and allows persons to respond to different types of humorous stimuli. It is necessary to differentiate between these variables (Mora-Ripoll, 2010).

Theories of Humor

Three main theories explain the functions of humor: the relief theory, which focuses on physiological release of tension; the incongruity theory, which focuses on contradictions between expectations and experiences; and the superiority theory, which focuses on sense of supremacy over others (Wilkins & Eisenbraun, 2009). Each theory accounts for the role of humor in specific situations: relief humor for relaxing tensions during social interactions, incongruity humor for presenting new perspectives, and superiority humor for criticizing opposition or unifying a group. The purpose that humor serves in any given situation may be open to interpretation, but the physiological effects are not. Cognition is needed to understand humor, but it is not needed for the physiological effects of laughter to occur. In other words, individuals will experience similar bodily reactions regardless of whether they laugh due to tension release or through appreciation of incongruities. A brief description of the three main theories about the functions of humor follows.

Relief Theory

According to the relief theory, people experience humor and engage in laughter because they sense that stress is reduced in doing so (Kuiper, Martin, & Olinger, 1993). Alternately, people may laugh at something humorous, which then results in a feeling of mirth and

sense of relief. Relief may involve a cognitive release from anxiety or a physical release of tension (Wilkins & Eisenbraun, 2009). The physiological benefits of laughter most closely align with this theoretical perspective as many negative health conditions are exacerbated by stress, and laughter has been shown to reduce the symptoms of such conditions. In individuals with bronchial asthma, for example, negative emotional states, can induce airway constriction, while positive emotional states can relieve airway constriction. Thus humor and laughter, and the resulting emotion, mirth, can unite the body and mind (Dossey & Keegan, 2008).

Incongruity Theory

The incongruity theory purports that people laugh at things that surprise them or at things that violate an accepted pattern—with a difference close enough to the norm to be nonthreatening, but different enough from the norm to be remarkable it will be further discussed in the next section. Briefly, the incongruity theory emphasizes cognition; individuals must have rationally come to understand typical patterns of reality before they can notice differences (Wilkins & Eisenbraun, 2009). A humorous situation must involve the perceiver's simultaneously having in mind one view of the situation that seems normal and another view of the situation in which there is a violation of the natural order (Veatch, 1998). This theory has support in neuroimaging research, which shows that the parts of the brain involved in resolving incongruities are activated while processing cartoons (Samson et al., 2009).

Superiority Theory

The superiority theory proposes that laughing at faulty behavior can reinforce unity among group members (Duncan, 1985). It is believed that superiority humor serves two important societal functions: it maintains social order as laughter, rather than aggression, is invoked toward those who refuse to comply with rules,

and through laughing together at others, it reinforces group unity (Long & Graesser, 1988), (Martineau, 1972). While the latter may seem like a malicious form of humor, it is one that we encounter surprisingly often. There are many television shows based on this very form of humor—Candid Camera and the multitude of spin-offs, for example, base their comedy on people caught in foolish and embarrassing situations (Wilkins & Eisenbraun, 2009).

Development of Humor in the Child

Pediatric dentists who are interested in helping young patients use humor effectively need to understand the developmental aspects of humor. A child's capacity to appreciate humor depends on their cognitive and sensory abilities, prior experiences, and stages of development. Changes in basic patterns of humor at different ages depend on underlying changes in intellectual development. A simple approach to the development of humor is based on the above-mentioned concept of incongruity. The term refers to absurdity, nonsense, and irony. Incongruity is considered as an essential element in the production and appreciation of humor. McGhee (1979) defined humor as the mental experience of discovering or appreciating ludicrous or absurdly incongruous ideas, events, or situations. Sense of humor develops parallel to emotional and intellectual development. Researchers have investigated the age during which the ability to recognize incongruities arises and have related it to other cognitive abilities that children might be develop, such as symbolic play (Loizou, 2006).

Using a cognitive approach to humor, Paul E. McGhee developed a theory which traces the development and appreciation of humor in children through defined stages and continues to form the framework for research in this area. Each stage is based on the children's cognitive abilities that enable the child to recognize and produce cognitive incongruities. Taking a cue

from Piaget's cognitive stages, McGhee first proposed a comprehensive stage-model of children's humor in 1979, linking the stages of humor development to Piagetian stages of intellectual development (Loizou, 2006). This model maps the type of humor the child is likely fascinated with to underlying changes in the child's ability to perceive and make sense of its world (Cunningham, 2005). The stages, as defined by McGhee were (1) incongruous actions toward objects; (2) incongruous labeling of objects and events; (3) conceptual incongruity; and (4) humor in multiple meanings (Table 23.1). Chronological ages may vary among individuals from one stage to another, but the sequence is thought to be identical for all (Dowling, 2002). McGhee refined the earlier definitions and published a new system of stages introducing five stages, including a pre-humor stage as described in 2002 (McGhee, 2002). A summary and description of these stages is presented and are of practical benefit to the pediatric dentist using humor in the dental setting.

Piaget's first stage of child development (0–2 years), sensorimotor development, is concerned with the perception and permanence of objects as well as the relationships between objects and self (Dowling, 2002). The infant explores the world through direct sensory and motor contact. This Piaget stage may be divided into two in relation to the child's humor development: the prehumor stage and first stage of humor development.

Stage 0 (first 6 months): *Laughter without Humor*, the prehumor stage. Although, during its first month of life, an infant may exhibit smiling and even laughter, it is a result of spontaneous activity of the central nervous system; however, toward the end of the first month of life, the first wakeful smile appears and tends to occur after feeding. Research on infants suggests that anything that is physiologically arousing to them, in a familiar or nonthreatening situation, can trigger laughter (McGhee, 2002). Pleasurable sensations, such as blowing, can elicit laughs over and over again. All forms

of tactile stimulation yield laughter: bouncing the infant on one's knee, quickly lowering the baby, or tickling are reliable causes of laughter. An unexpected noise such as clapping may result in either laughing or crying. By age 4 months, a broader smile connected to a broader range of events including moving objects or lights appears. The infant begins to respond to visual human items and not only to tactile stimuli (such as kissing stomach, lip popping).

Stage 1 (6 to 12–15 months): *Laughter at the Attachment Figure*. In this stage, the infant demonstrates an increasing awareness of its interpersonal surroundings and participates in social humor with a parent or other attachment figure through visual and aural games. The baby responds to visual and social items such as mother sucking on a bottle, father waddling like a penguin, any unusual behavior of the attachment person and disappearing objects. Objects do not fit the schema into which they are being assimilated (Loizou, 2006). They are temporarily used in a way that differs from an ordinary one, such as in a game of "peek-a-boo." The child looks for the puppet on one side of the crib and then erupts in laughter when it unexpectedly shows up on the other side. In addition, the infant still enjoys physical social stimuli, reacting with laughter to vigorous physical play like throwing the baby in the air or tickling.

Stage 2 (12–15 months to 3–5 years): *Treating an Object as a Different Object*. At stage 2, children begin producing "jokes" nonverbally by performing incongruous actions, such as putting a bowl on their head as a hat or pretending to talk into their shoe, any incongruous action with an object. Another form of typical humor is using the correct object, but applying it to the wrong object, for example, the child may ask: "Brush ear?" In these cases, the same behavior may be just as funny if it is the mother, father, or another sibling who initiates it (McGhee, 2002). The child's frame of mind determines whether it's humor or not. This stage is significant since it presents the earliest self-created humor. This stage is the parallel of *incongruous actions toward objects* from the initial McGhee

Table 23.1 Comparison of Piaget's (1962) Cognitive Stages of Child Development with McGhee's (1979, 2002) Proposed Stages of Humor Development

Stages of cognitive development (Piaget)	Stages of humor (McGhee, 1979)	Stages of humor (McGhee, 2002)	Example	Dental application
Sensorimotor (0–2 years) Object perception Object permanence Relationships between object and self	Stage 1: 1–2 years Incongruous actions toward objects • -physical play	Stage 0: First 6 months: <i>Laughter Without Humor</i> , the prehumor stage Stage 1: 6 to 12–15 months Laughter at the Attachment Figure	Tickling Peek-a-boo	Smiling and making funny noises Counting fingers and continuing to tickle arm
Preoperational thought: egocentric (2–4 years) Views life from own perspective Conversations with self Perceptual problem solving Preoperational thought: intuitive (4–7 years) Social/communicative conversations Conceptual problem solving Semilogical thinking Concrete operations (7–11 years) Logical reasoning of concrete problems More objective view of life Cooperation and mutual respect emerge	Stage 2: 2–3 years Incongruous labeling of objects and events Stage 3: 3–7 years Conceptual incongruity Stage 4: 7 years to adulthood Humor in multiple meanings • humor becomes more “culture/social” specific and sophisticated	Stage 2 (12–15 months to 3–5 years): <i>Treating an Object as a Different Object</i> . Stage 3: <i>Misnaming Objects or Actions</i> (2 to 3–4 years) Stage 4: <i>Playing with Words. Playing with Word Sounds</i> (not meanings) (3–5 years) Stage 5: <i>Riddles and Jokes</i> (6–7 years to 10–11 years).	Using a bowl as a hat Calling a cat a dog “Daddy, faddy, paddy” Why did the boy tiptoe past the medicine? He did not want to wake the sleeping pills.	Finger as a toothbrush Misnaming colors, calling a blue mirror or chair red While using nasal mask tell patient to breathe through their nose and not through their toes. Would you like me to check your teeth or did you come to fix your hair?

Based on Dowling (2002).

system of humor development and corresponds to Piaget's Sensorimotor stage (Object perception, Object permanence, and relationships between object and self).

Stage 3: *Misnaming Objects or Actions* (2 to 3–4 years). Once the child's vocabulary hits a critical point, the young child can extend incongruity humor to misnaming objects or actions: calling a cat a dog, a shoe a sock. After age two, parents are asked by their child to name people and things. Toddlers are very excited by the realization that everything has a name and begin playing with the names of things. Many parents first see this new form of humor in the "Show me your nose" game. Even if the parent has always played the game straight, the day always arrives when the child is prompted to "Show me your nose," and exhibits a mischievous grin and points to his or her ear. The child may or may not laugh, but there's no doubt that this is pretty funny to them. McGhee notes that children at this stage often enjoy calling things by their opposite name—cold as hot, boy as girl. While humor based on using objects in "wrong" ways continues throughout the peak of pretend behavior during the preschool years, budding language skills generate new opportunities for humor. The previous equivalent stage is incongruous labeling of objects and events corresponding to Piaget's Preoperational Thought: Egocentric (views life from own perspective, conversations with self, and perceptual problem solving).

Stage 4: *Playing with Words*. Playing with Word Sounds (not meanings) (3–5 years). As the child's verbal competence grows, he or she is less dependent on objects as the source of humor. The preschooler may experiment with rhyming words, made-up silly words, and other humorous play that does not directly link to concrete objects within their reach. Many children are especially fond of the verbal expression of humor found in stories and poems like *The Cat in the Hat* (Seuss, 1957). Humor includes playing with word sounds—not meanings, altering funny words, creating nonsense words. Several new forms of humor emerge by the end

of the third year. Simply calling things by the wrong name continues to be funny after age two, but a new way of playing with words appears around age three. Children become much attuned to the way words sound, and begin playing with the sounds themselves. This often takes the form of repeating variations of a familiar word over and over, such as: "daddy, faddy, paddy" or "silly, dilly, willy, squilly" (McGhee, 2002). Sound play may also show up by altering the sound of a single word in an otherwise normal sentence, such as: "I want more tato-wato-chatos" for potatoes. Complete nonsense words may also appear, as in: "Let's all spooty-dotty-ditty-bip."

Toward the later part of this stage, previously labeled, *Conceptual incongruity*, there is a dramatic change in the form of humor which emerges due to the fact that children begin to develop conceptual thought (Loizou, 2006). Humor is centered on violations of conceptual representations: conceptual incongruity (McGhee, 1979). Three- and four-year olds take great delight in distorting familiar concepts (Wolfenstein, 1954). An example of humor based on violation of conceptual representations is a cartoon of a cow which scratches its back with a brush and whistles like a canary while taking a bath in a bathtub or a picture of a bicycle with square wheels or an elephant sitting on a tree limb (Bariaud, 1989).

Stage 5: *Riddles and Jokes* (6–7 years to 10–11 years). A general shift in children's humor begins to occur in the early elementary school years. While the general silliness common to much of the humor that occurs in younger children's physical play still occurs, there is a gradual reduction in the degree of reliance on physical action for humor. Humor in the absence of actions has occurred prior to this in Stages 2, 3, and 4, but there is a much more striking reliance on thought and language alone for humor by first or second grade (McGhee, 2002). The defining feature of this stage is the acquisition of a new level of cognitive functioning which permits simultaneous awareness of double meanings of the same word—the key to getting

a riddle. The shift that occurs in children’s humor at about age seven is more striking than that shown at any other age (McGhee, 2002). By seven, most kids make the exciting discovery that the same word can have two different meanings, and that one can use this revelation to trick others. During Piaget’s stage of concrete operations, the child can think logically about concrete objects and can thus add and subtract. The child also understands conservation. Thought is no longer dominated by perceptions; children can consider logical relationships between events and solve problems from their experiences. Children appreciate the complex structure of humor and the motivations behind its use. As children develop, they begin to understand that humor has a meaning—that jokes must resolve from something absurd into something that makes cognitive sense. Children often start memorizing riddles and jokes and using them as a means of initiating social interactions with peers and adults.

The pediatric dentist should consider the child’s stage of humor development and design and employ the proper use of age-appropriate humor.

Practical Application of Humor in Pediatric Dentistry

General Benefits of the Use of Humor in Practice

Although much emphasis has been placed on the value of humor in health care (Williams, 1986, Robinson, 1991, Rohtbart, 1991, Fry, 1992), little has been written about using humor as a tool to improve communication with children (D’Antonio, 1989, Bennett, 1996) in general, and in particular, in dentistry (Nevo & Shapira, 1986). Humor can reframe a child’s experience and help him overcome the fear and anxiety associated with stressful situations. Also, because humor reduces the emotional distance between people, it has the potential to improve communication not only with the child, but

with the parents as well (Bennett, 1996). Of all the medical specialties, dentistry is unique in many ways: multiple visits, social stigma of associating pain with dentistry, and annual visits. In addition, visits are often invasive, the area of treatment is within the very sensitive facial area and the actual physical distance between dentist and patient is very close. Humor can assist the dentist on all levels including: relieving anxiety and pain, and closing the emotional gap between the caregiver and patient. The potential benefits that humor brings to medical care are summarized in Table 23.2.

Pre-Examination: The First Encounter, Meeting the Patient, Establishing a Direct Path of Communication

While most practitioners adopt certain techniques to facilitate working with children, for example, having pins attached to their scrubs, fun posters, and games in the waiting room and

Table 23.2 Positive Effects and Benefits of Using Humor with Children

Narrows cultural and socioeconomic interpersonal gaps
Improves communication with the child
Fosters a sense of trust
Relieves anxiety
Relieves tension
Reduces the emotional distance between the practitioner and the family
Gives parents a positive sense of their child’s ability to relate to adults
Gives the child a sense of mastery and control
Improves cooperation during the physical examination
Helps children feel better about the visit and look forward to coming back
Communicates caring
Enhances healing
Provides an acceptable outlet for anger and frustration

Table based on Wender (1996) and Bennett (1996).

giving stickers as rewards, more can be done to increase one's humor quotient in the office.

The first objective in the successful management of the young child is to establish communication. By involving a child in conversation, the dentist not only learns about the patient but may also relax the youngster (Wright, Gardner, & Starkey, 1991). Greeting patients is the first part of the dental encounter and experience. It often sets the tone for the entire visit. One of the most critical challenges facing the dentist during the patient's first visit is opening up a direct channel of communication with the child; effectively bypassing the parent and talking directly to the patient. Humor may be used to achieve effective communication. The development of good rapport with the patient is essential and probably the basis and key for the success of many dentists with children in their practices, with communication being the most important aspect of behavior management.

There are many ways of initiating verbal communication, the effectiveness of these approaches differing with the ages of children. The objective is to have the child actively engage in conversation and not just passively answer to yes or no questions with the nod of a head. Traditionally, pediatric dentists have been trained to ask the child about their clothes. Another classic behavior management technique is complimenting the child: "wow, your shoes are very handsome!" Other suggestions have been to start with nonthreatening questions such as "how old are you?" or "what is your name?" However, some children will refuse to answer and just shrug their shoulders and hide behind their parent. Actually eliciting a verbal response is important. The beginning of communication and establishing a relationship with the patient is through verbal conversation. In the unpredictable world of dealing with children, improvisation is key to success, as the ever-changing situation demands. Children are often shy and reluctant to talk when they are placed in a new situation and frightening experience. They are not used to speaking with strangers. However, when they gain con-

fidence and are more comfortable in the new environment, they may begin to speak more freely. For example, asking a child their age may frequently be followed by a nonverbal response: they may identify their age by holding up the appropriate number of fingers. At this point the dentist may employ humor to break the ice. The dentist may respond by miscalculating the age or exaggerating the age: "Oh you are already eight!" the child being only four or five. Another technique is mislabeling. The child is not asked his age, rather, a boy is assumed to be a girl. "Are you a girl?" The child's immediate answer is: "I'm a boy," usually accompanied by a smile. If two siblings are present, and one is obviously taller and older, the conversation begins: Who is older? Addressing the obviously younger child, "Are you older than your sister? I thought you were older but just shorter." Or, if the older child answers and identifies himself as being, for example, Jack, the dentist turns to the younger sibling and asks if his name is also Jack. Most children will immediately answer with a smile and laugh that their name is not Jack! The parent will also laugh in the background and the child will excitedly reply that his name is Steve. Once the child reacts and answers the dentist, the channel of communication has opened. Conversation can continue, "I am happy to meet you, by the way my name is Dr. Smith, what is your name?" This time the child complies, revealing his/her name. Most importantly, the effect of humor is cumulative. The child begins to be relaxed and anticipates the rest of the visit expecting more fun to take place. The effect of humor also affects the parent, who in turn radiates a relaxed feeling to the patient, who gains confidence and is ready for the examination.

Examination

Upon entering the treatment room, the child can be asked his/ her favorite color and to choose a color of a mirror. The dentist can repeat the color and then proceed to give the child a different color! This can also be used for choosing

a rubber dam color. A more sophisticated approach can be to choose between a green mirror and a green mirror. Between filling a tooth or . . . filling a tooth! The choice is theirs.

The dental chair can be designated a space rocket or a mall "ride." The dentist puts "money" in the chair and it starts to move up and down like a ride. At the same time humor may be addressed to the parents by adding "however, this ride is a lot more expensive than the mall ride!"

Ask about the characters the child identifies with and then mix things up a bit. For example, "Winnie the Pooh is a horse, right?" (Bennett, 2003).

While tapping teeth, the dentist can make silly noises. Tap the nose. Get mixed up while counting teeth.

During the use of nitrous oxide the child is instructed to breathe "through your nose and not through your toes." Why? "Because you can't breathe through shoes, silly!"

Ask the patient if she likes pickles, smickels, shmickels, or tickles.

Older children appreciate jokes and riddles and a type of office-based slapstick, such as getting caught up in curtains or making mistakes when palpating parts of the patient's mouth (Bennett, 2003).

Treatment

Over a half a century ago, Addelston (1959) formalized a technique that encompasses several concepts from learning theory. Since its introduction it has remained a cornerstone of behavior management. Tell-show-do technique (TSD) is a series of approximations, a component of behavior shaping and is used by many pediatric professionals. The dentist demonstrates all aspects of treatment in a step by step manner before their application. This technique of behavior shaping is used by many pediatric professionals. The technique involves verbal explanations of procedures in phrases appropriate to the developmental level of the patient (tell); demonstrations for the patient of the

visual, auditory, olfactory, and tactile aspects of the procedure in a carefully defined, nonthreatening setting (show); and then, without deviating from the explanation and demonstration, completion of the procedure (do). The tell-show-do technique is used with communication skills (verbal and nonverbal) and positive reinforcement (American Academy of Pediatric Dentistry Guidelines, 2012, pp. 161–173).

When analyzing the method, one may conclude that the foundations of TSD are based on humor and fantasy. Words such as hurt and pain are avoided and frightening or strange terms are substituted with friendly, intriguing words. For example, an injection is not referred to as the "shot" but rather is a "pinch," anesthetic is "sleepy juice," numb is "fat and funny," suction is "vacuum cleaner," saliva ejector is "Mr. Thirsty" or "magic straw," explorer is a "tooth counter," and a rubber dam becomes either a "raincoat" or "umbrella" to be used since a storm will take place in the child's mouth including rain and wind (Lekic, 2011). A table of common humoristic terms is presented (Table 23.3).

At the end of successful treatment before settling the bill, tell the parent that the motto of the office is: "In our practice children don't cry, only the parents do!"

Most importantly, the effect of humor is cumulative. When children and parents realize that the dentist enjoys sharing with them humor, they anticipate returning for their next visit with a smile and cooperating with the dentist at subsequent visits.

Humor and the Stress of Pediatric Dentistry

Humor has also been used by dentists as a form of tension release. The release of tension is of particular importance to dental professionals. Dentists perceive dentistry as being more stressful than other occupations (Gale, 1998). Dentists encounter numerous sources of stress beginning in dental school. On entering clinical

Table 23.3 Suggested Humor Dictionary

Dental terminology	Humorous terminology
The dental chair	Airplane, spaceship, ride, elevator
Opening the mouth	Open your mouth like a tiger Let's see if you have teeth (or a tongue)
Dental light	It's very dark in your mouth, there are no windows so let's put on a light
Topical anesthesia	Funny tasting jelly
Local anesthetic	Sleepy juice, only your teeth go to sleep, you stay awake to help
Numbness	Feels funny but you don't look funny!
Rubber dam	Raincoat, umbrella
Rubber dam clamp	It's a tooth ring; put it on your finger and see if it fits!
Suction	Vacuum cleaner
Saliva ejector	Mr. Thirsty, magic straw: spit goes into the straw, not out!
Low speed turbine	Tractor, choo choo train
High speed turbine	Rain machine, fireman's hose
X-ray machine	Special camera, looks like an elephant.

Based on Nevo, O., & Shapira, J. (1989) The Use of Humor by Pediatric Dentists. *Journal of Children in Contemporary Society*, 20(1-2) 171-78. http://www.tandfonline.com/doi/abs/10.1300/J274v20n01_13. With permission from Taylor & Francis Ltd.

practice, they can find that the number and variety of stressors often grow. Clinicians experience numerous workplace, financial, practice management and societal issues for which they often are unprepared. For some dentists, these issues may significantly affect their physical health, mental health or both. Clinical disorders such as burnout, anxiety and depression may result. These disorders may have certain negative effects on dentists' personal relationships, professional relationships, health, and well-

being. A study of more than 3500 dentists found that 38 percent of those surveyed always or frequently were worried or anxious (Dunlap & Stewart, 1982). Moreover, 34 percent of the respondents said that they always or frequently felt physically or emotionally exhausted, and 26 percent said they always or frequently had headaches or backaches. These symptoms often are associated with anxiety and depression (Rada & Johnson-Leong, 2004). Problems with time management and staying on schedule, coping with anxious parents with difficult children, the workload, governmental interventions and a constant drive for technical perfection are all responsible for the especially high level of stress in pediatric dentistry.

The stress-related problems associated with dentistry arise from the work environment and the personality types of the people who choose the profession. The operatory usually is small, and the dentist's focus is on an even smaller space, the oral cavity. Dentists are required to sit still for much of their workday, making very precise and slow movements with their hands, while their eyes remain focused on a specific spot. Humor may be used as a coping mechanism and assist in reducing stress and tension.

For health professionals, humor helps narrow interpersonal and cultural gaps, communicate difficult messages, express frustration and anger, and cope with anxiety (Beck, Daughtridge, & Sloane, 2002, Granek-Catarivas et al., 2005), (Ackerman et al., 1994, Yates, 2001). One study found that doctors without malpractice claims are characterized by a sense of humor (Levinson et al., 1997). Medical humor has appeared in a wide range of journals, from those of international reputation, to specialty journals, to "throwaways." Those areas targeted for humor include medical school and residency training, medical language, academia, writing and publishing, research, and clinical practice. Although the authors have primarily been physicians, medical humor has also been written by nurses, PhDs, and occasionally even by lay people (Bennett, 1995).

Articles in professional dental journals have been published as well as new age electronic media chat rooms, blogs, and videos have dealt with many stress related issues involved in daily pediatric dentistry. In addition, controversial issues have also been featured in dental humor, including patient management, the use of restraint, radiographs, and fluoride.

In one cartoon, the dentist is seen smiling and patting his pediatric patient on the back, while telling the boy's mom: "You wouldn't believe how well dental floss works to improve Tommy's checkups." The patient is of course wrapped around with dental floss and has been passively restrained.

Another cartoon dealing with patient management depicts a child on the dental chair (Fig. 23.1):

Dentist: Well, Bethany . . . I understand you have a sore tooth. I'm going to take this little instrument and have a loo—

Child: NO!!!

Child: AAAGH!
HOWL!!!
AWP!!!
WHINE!!!
AAAHH!

Dentist: Your mother has gone down to the pharmacy. She can't hear you.

Child: Oh.

Child proceeds to open mouth and cooperate during treatment.

Issues such as practice management have also been addressed. A patient has just completed payment and is seen walking away from the reception window smiling. The dentist tells his assistant: "I use laughing gas when I give them their bills, too!" (Fig. 23.2).

With regard to the tension of being a dentist: A toothbrush tells his colleague: Sometimes I feel that I have the worst job in the world! His colleague, a roll of toilet paper answers: Ya . . . right!

Applications are available in which a script is written and automatically the text is converted into an animated video. Dentists have used this technique and have published numerous videos on YouTube. Among the titles: *A day in the life of a pediatric dentist*, *Dentist talks to stupid mother*, *If dentists spoke their minds*. In addition, to the filmmakers sharing their frustrations, viewers are able to add their comments. The videos provide a comic relief from the frustrations and tensions of daily practice and an outlet for dentists.

For Better or For Worse®

by Lynn Johnston



Fig. 23.1. For better or for worse © 1995 Lynn Johnston. Used by permission of Universal Uclick. All rights reserved.

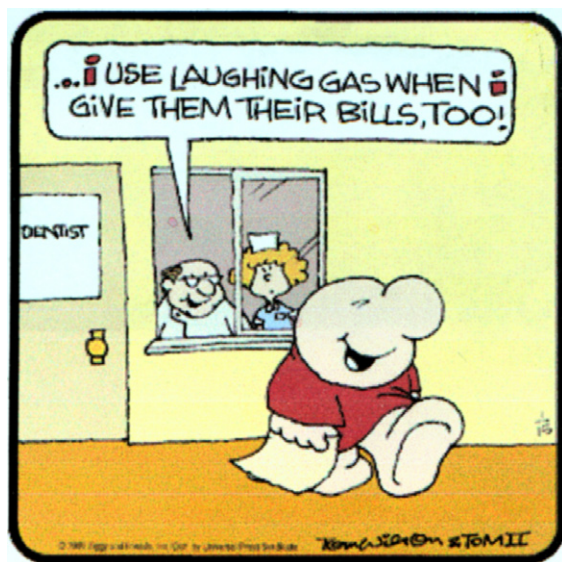


Fig. 23.2. Ziggy © 2003 Ziggy & Friends. Used by permission of Universal Uclick. All rights reserved.

Summary

The use of humor in pediatric dentistry is highly recommended. It may be used to facilitate communication with patients and parents, alleviate patient anxiety, and assist the dentist in coping with stress associated with the practice of dentistry.

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24

Work Stress, Burnout Risk, and Engagement in Dental Practice

Ronald C. Gorter

Key points

- Demands from the dental environment, when not adequately coped with, may result in professional burnout.
- Stimulating aspects from working as a dentist relate strongly to positive engagement and have a buffering effect on burnout risk.
- A strong relation exists between burnout risk and physical complaints.
- How dental students cope with study stress may be indicative for how they cope with professional demands later in their career.
- Since experiencing stress is highly determined by the interaction between the person and the environment, individually tailored prevention measures are an adequate means to prevent burnout.

Introduction

Does work cause illness? In most publications on work and health, the emphasis is on health risks as caused by work and work circumstances. The literature on work-related illness is abundant and describes nearly every imaginable kind of physical, psychological, or social malfunctioning as explained by work-related factors. So, it is plausible to state that work does cause illness indeed.

On the other hand, awareness grows that work also provides for a positive influence on a person's life (Schaufeli, Bakker, & Salanova, 2006; Bakker et al., 2008). There is a growing stream of literature in which the health effects of "structured, goal-directed activities, of a compulsory kind" (also known as work) are described. Occupational therapy, for instance, is a widely used means for recovery. Even more so, from studies on unemployment, we know that loss of work may lead to serious health problems, including suicide risk. Therefore, the proper conclusion is that work contains both health-threatening as well as health-provoking aspects.

In this chapter, both the health-threatening and the health-provoking aspects of working as a dentist will be described, focusing on mental health. In particular, the interplay between work stress and burnout, and work resources and positive engagement, will be discussed, using the Job Demands–Resources Model as a frame (Bakker & Demerouti, 2007). Finally, some remarks on dental student stress and pieces of advice for burnout prevention will be given.

Stress and Work

In its original meaning, stress refers to a condition in physics where pressure is put upon tissue, to the extent that the structure of the tissue is about to be irreversibly changed.

In psychology, stress refers to the variables that influence one's well-being. This is usually

meant in a negative way, distress would be the correct word, whereas it is also recognized that a certain amount of stress—eustress—is needed in order to be stimulated and achieve results. Work stress usually refers to the demanding aspects of work that cause a person to feel to be "under stress." This illustrates the somewhat confusing way the word stress is used in everyday language; it is both used as a causal factor and as a result of things.

A common approach to work stress emphasizes the interaction between an individual and the work environment (Lazarus, 1995). When an individual evaluates the (work) situation as being threatening and does not know how to deal with the threat, then stress is likely to occur. The demands of the job, such as work contents, circumstances, terms of employment, and professional relations, in combination with one's individual perception of predictability, controllability, and social support, can make identical work a nuisance for one person, while a joy for someone else (Gorter et al., 1998). Thus, one may perceive one's work and the work environment to be demanding, and yet feel perfectly able to deal with the circumstances (coping).

Work pressure is not only to be found in an overload of work, it can also be the result of a lack of fit between one's personal capacities or ambitions. Things become difficult when one no longer feels capable of managing them, for instance, as a result of lack of energy. In other words, there is an interaction between the demands one is confronted with and the available resources one has. The perception of this interaction is highly subjective; one's personal interpretation of demands and resources is decisive for one's well-being. Demands and resources may be in or out of balance (Fig. 24.1).

As stated earlier, one performs best with a certain amount of tension or stress. Too little challenge can also be experienced as stressful. Having to deal with a chronic overload or a chronic lack of challenge may result in health complaints; physical complaints, negative thoughts, mood problems, changes in social relations, or changing behavior are symptoms

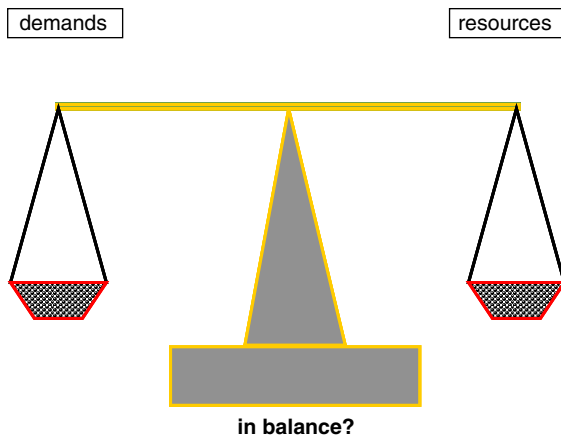


Fig. 24.1. Balance between demands and resources.

that often coincide with being under chronic stress.

The Job Demands–Resources Model

A promising model to describe the interplay between demands and resources in the work setting is the Job Demands–Resources model (Schaufeli & Bakker, 2004; Bakker & Demerouti, 2007). At the starting point of the Job Demands–Resources model is the assumption that regardless of the type of job, psychosocial work characteristics can be categorized into two groups: job resources and job demands. Job demands refer to those aspects of a job that require sustained physical and/or psychological effort and are therefore associated with certain physiological and/or psychological costs. Job resources refer to the physical, psychological, social, or organizational aspects of a job that (a) may reduce the negative effects of job demands, (b) are functional in achieving work goals, and (c) stimulate personal growth, learning, and development (Hakanen, Schaufeli, & Ahola, 2008).

The interplay between job demands and resources may result in either health impair-

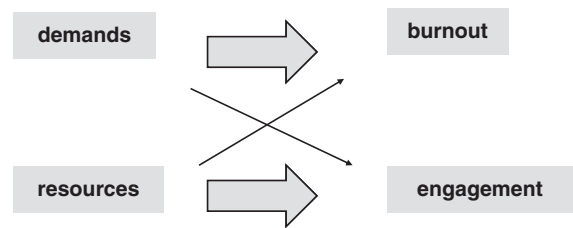


Fig. 24.2. The Job Demands–Resources model (adapted from Bakker & Demerouti, 2007).

ment, or motivation, to a certain extent (Fig. 24.2). Prolonged experience of job demands, without sufficient buffering work resources, may result in professional burnout, which is to be described later. Alternatively, when job demands are dealt with adequately, and work resources are plenty, positive engagement may be the result. Engagement will also be further described later. It is also understood that demands and resources have crossover effects on engagement and burnout.

Burnout

A possible reaction to chronic work stress is burnout (Maslach, Jackson, & Leiter, 1996). Burnout is defined as

- a. a state of emotional exhaustion,
- b. in which one becomes cynical about one's recipients of care, and
- c. feels less is accomplished in work.

Burnout should be considered as a process; it is not so much a state of being burned out or not. Metaphorically speaking, burnout is like trail leading downhill of which one realizes he or she is upon it when already quite a distance going down. In another metaphor, one could speak of a battery still providing energy for light, but not receiving any input, and therefore running empty. In essence, burnout occurs to those dedicated to their job, willing to give much, and often not realizing or ignoring the fact that “the candle burns at both ends.” The

dedicated professional realizes that all energy is used when this already is a fact. One is used to a pattern of demanding so much of oneself that the thought of postponing things or restricting oneself otherwise never occurs, or is ignored.

Positive Engagement

In recent years, research is also focusing on what is called positive psychology of work, in addition to a long history of studying health-threatening aspects of work. Work engagement is described as a multidimensional construct, defined as a positive, fulfilling, work-related state of mind that is defined by vigor, dedication, and absorption (Schaufeli & Bakker, 2004):

1. Vigor is characterized by high levels of energy and mental resilience while working, the willingness to invest effort in one's work, and persistence even in the face of difficulties.
2. Dedication is characterized by a sense of significance, enthusiasm, inspiration, pride, and challenge.
3. Absorption is characterized by being fully concentrated and deeply engrossed in one's work, whereby time passes quickly and one has difficulties with detaching oneself from work.

Although conceptually apparently the opposite of burnout—also consisting of three underlying dimensions—recent research indicates that engagement is not to be seen that way (González-Romá et al., 2006). Burnout and engagement can be present in a professional at the same time to a certain degree.

How Do These Processes Appear among Dentists?

To illustrate the process of a dedicated professional in dentistry turning into a burnout victim, the dentist's story in Box 24.1 is illustrative.

Burnout Profiles

One could raise the question whether the burned out dentist is characterized in one typical way, or that a variety of profiles of burned out dentists exists. From a series of interviews with dentists suffering from burnout-related complaints, rather than one typical type of "the" burned out dentist, five typical profiles could be derived, as described in Box 24.2 (Gorter, 2000). The dentist as portrayed in Box 24.1 would be a typical example of the "frantic runner."

Demanding Work Aspects in Dentistry

There is a steady line of research on job demands in dentistry throughout the last decades (Cooper, 1987; Gorter et al., 1998; Denton, Newton, & Bower, 2008). And although specific aspects may differ by country, certain factors of the dental work environment appear to be identified so regularly that they can be considered to be at the core of job demands for dentists (Table 24.1).

Again, the list in Table 24.1 is not exhaustive. Some of these factors have shown to be relevant in explaining burnout among dentists. Lack of career perspective, difficult patient contacts, and general work pressure appeared to be strongly related to a high burnout risk among dentists. Also, unfulfilled expectations one had at the start of a career explained differences in burnout among dentists to a high degree. On the other hand, research also showed that the more specialized dentists are, the lower the burnout levels found (Denton et al., 2008; Gorter, Jacobs, & Allard, 2012).

Burnout and Health Complaints

Research among dentists shows there is a strong and significant relation between burnout and physical complaints. Although no clear cause

Box 24.1. A dentist's story

I graduated when I was 24, so now I have been a dentist for 15 years. As a student, I was already used to working quick and efficiently. When I graduated, the banks were all too keen to loan me money so I could start a brand new practice.

From the moment I started in my practice, I had one focus: all attention is for the patient. I did not pay much attention to creating a nice atmosphere for my staff, since I thought that everything that was not focused upon the patients' needs was of secondary importance.

When patients had to wait, I felt stressed because I kept them waiting. And with pain it was even worse; in this profession you cannot avoid to sometimes cause pain. But, it was as if I felt that pain myself. That's the strange thing in our profession: you are a "good" dentist when you haven't hurt the patient, even when that means your treatment wasn't optimal.

It's in my nature to want to do everything myself. If I had others do things, I always had to check it myself and do it over anyway, so I was used to doing it myself straight away. Particularly so in my solo practice of course. But also in my private life I tend to be the first person that stands up when something has to be done. I am active in several community organizations, and also there I feel responsible that everything is done well.

At home I become more and more irritated. When I woke up, I already felt tired. Because I have to look in patients' mouths in a concentrated way, I got eye problems. In the evening I could not stand watching TV after work. When we went on holidays as a family, it always took me days and days before I was used to big wide open space around me. And at the end of the holidays, when I was finally

relaxed, I hated it that I had return to all these little mouths.

I had had a slight pain in my chest before. My physician advised me to slow down, but you know, our clinic agenda is always full. And I was used to being harsh to myself, I have always been. No staying home when you have the flu for me, you just take a pill. When others called sick, I always thought they were not suited to be a dentist. So I continued in the same way.

I must say my social environment did warn. My family, some friends. They saw me running and running. And also noticed my changing mood. I got angry outbursts more often, was irritated more easily. But I denied their remarks.

Then, one day, I broke. It was in busy time before the end of the year, after which some health insurance policies would change. So many patients wanted to have something fixed under the old policies. One patient called by telephone with a simple question about this insurance change. And I went mad! I kicked at the wall, shouted to the patient through the phone, yelled at my assistant! And then I broke out in tears, and I went home . . .

I had given everything I had for my patients for 15 years. And now I could no longer. That was so emotional. I have been out of practice for more than half a year. I had professional therapists counseling, and I used some medication. Then I slowly started to start working on a therapeutic basis. Together with my wife, I am trying to work out changes in our life pattern. My life has been out of balance for so long, I cannot get that back in balance at once. I am happy we had professional help, this is something you cannot fix yourself.

Box 24.2. Burnout profiles of dentists

The treadmill walker:

This dentist is caught in the daily, repetitive routine of dental practice. He can see no way out and is resigned to his fate. He can see few career options, and he feels that his professional development is at an end.

The crushed idealist:

The crushed idealist is the disillusioned dentist. His image of dental practice has been crushed by the reality of clinical practice and can see no way forward in his career.

The frantic runner:

This type of dentist tries to pack more and more into an already busy schedule. He has the tendency to become physically and emotionally exhausted.

The disgusted dentist:

This dentist has come to dislike every aspect of dental practice. He realized at an early stage in his career that he had chosen the wrong profession. He finds it difficult to interact with his patients and yearns for retirement.

The depressed dentist:

This type of dentist is miserable and unhappy. He finds no rest from his depressed state whether at home or at work. He neglects his family, colleagues, and patients and finds little satisfaction in any aspect of his lifestyle.

and effect can be determined, given the cross-sectional design of most research, the correlations between physical and psychological conditions are univocal. Dentists who were identified with a high burnout risk reported statistically significantly greater (physical) health complaints than their colleagues with a low burnout risk (Gorter, Eijkman, & Hoogstraten, 2000).

In many cases, when one becomes mentally exhausted, bodily tensions are felt more intensely. On the other hand, when one suffers

Table 24.1 Work Demands in Dental Practice

• Practice management	• Lack of recognition
• Difficult patients	• Lack of career perspective
• Physical pressure	• Time pressure
• Routine	• Restrictions to free entrepreneurship
• Changes (micro/macro)	
• Fear of lawsuit	
• Working solitarily	

from a growing number of physical complaints, it costs more mental energy to continue what one is doing. Therefore, the causal relation is difficult to determine. Nonetheless, both processes seem to play a role among dentists with a burnout risk.

The dental profession is known for its demanding character with regard to physical aspects. Every dentist will know by experience how often patient treatment is done while keeping one's body in unnatural postures. Working on the upper front teeth with indirect sight is just one example of this. Add to this, generally speaking, the lack of attention for ergonomics in the dental curricula, and the ingredients are there for a career in which one's body is gradually undermined. Even though dentists can be regarded as a relatively healthy professional group, when compared to professions with a lower socioeconomic status, musculoskeletal and cardiovascular complaints are widespread among the profession (Burke, Main, & Freeman, 1997). Also ear and eye complaints are common among dentists. Given the high correlation between physical complaints and burnout risk, increasing attention for the prevention of physical discomfort may also be useful in burnout prevention.

Job Resources

Just as work demands show a correlation with burnout, the Job Demands–Resources model assumes that stimulating aspects from the work environment, also labeled job resources, show a correlation with engagement. Job resources have been investigated among dentists, and

Table 24.2 Job Resources in Dental Practice

• Seeing good results	• Grateful patients
• Successful diagnose and treatment	• Completing interesting restorations
• Relieving patients' pain	• Gaining patients' trust
• High quality of work	• Working with head, hands, and heart
• Fixing problems	• Seeing patients laugh again

factors such as immediate and long-term results of work, esthetics, and working with patients do show strong relations with engagement (Hakanen, Bakker, & Demerouti, 2005; Gorter et al., 2008) (Table 24.2).

The Job Demands–Resources Model among Dentists

As was already indicated earlier, lack of career perspective, difficult patient contacts, and general work pressure are among the major job demands that explain differences in burnout levels among dentists. Also certain job resources appeared to explain differences in engagement levels among dentists; engagement was influenced by treatment results, doing well toward patients, and the joy of manual–technical work (Gorter & Freeman, 2011).

Dentists reporting to do their work with a certain idealism show higher engagement levels. It is acknowledged that there is an overlap between terms such as idealism and, for instance, dedication, which may partly explain this relation. Experiencing satisfaction from the results of their work is a strong job resource among male dentists which explains higher engagement, whereas the same goes for female dentists with regard to receiving satisfaction from patient care. Aspects such as entrepreneurship and material benefits show a relatively low correlation with engagement among dentists.

A lack of career perspective, which was among the job demands list, showed a strong predictive value for burnout risk. From a differ-

ent perspective, it shows that those dentists not characterized by a lack of career perspective show higher engagement levels (and lower burnout levels) (Denton et al., 2008; Gorter & Freeman, 2011).

When mean levels are discussed, it is always important to underline that individual differences may not be neglected. What is seen as a burden for one dentist may be a joy for another one. Take for example patient contacts, which may be troublesome for some, and can be the core of satisfaction in work for others. The same goes for entrepreneurship, which may be exciting and challenging for some, but a real worry for others.

There is evidence that burnout levels among dentists differ between males and females (Gorter et al., 1998). Whereas among male dentists the middle-aged group (roughly ages 40–55 years) shows highest mean scores, among females, the first 10 years of practice (roughly ages 25–35) appear most vulnerable. Depending on situational context, a certain selection mechanism plays a role in explaining this difference. In many countries, the male dentist is the principal family cost winner, which leaves little opportunity for diminishing one's working hours. Female dentists often combine work with family responsibilities and choose to work less hours when children are still young. Those females who succeed in organizing work and private life best are usually not the ones with burnout risk.

In many countries, there is a shift in percentages of females working as a dentist, in the sense that more females will graduate as a dentist than males. This will affect the way in which dentistry is practiced, organization wise, with probably more people working part-time. As a result, this will also affect burnout outcomes among dentists in the near future.

Person–Environment Fit

At the beginning of this chapter, it was pointed out that individual differences are decisive when it comes to describing burnout risk. A

common term in organizational psychology to refer to this: the person–environment fit. When there is no fit between an individual professional, such as a dentist, and the working environment, one speaks of a “mismatch.” This mismatch is a subjectively experienced matter, as a situation of chronic imbalance in which the job demands outweigh the dentist’s ability to function satisfactorily and provide less satisfaction than a dentist needs. Instead of a single root cause for burnout, such as emotional overload, six types of person–job mismatches are considered to be potential sources of burnout (Maslach & Leiter, 1997):

1. Work overload (one has to do too much in too little time with too few resources)
2. Lack of control (no opportunities to make choices and decisions or to use problem-solving abilities)
3. Lack of reward (inadequate job resources)
4. Lack of community (a loose and unsupportive social fabric, social isolation, and chronic and unresolved problems)
5. Lack of fairness (employees are inequitably treated and respect and self-worth are not confirmed) and
6. Value conflict (the requirements of the job do not agree with personal principles).

Dental Students and Stress

Stress among dental students has been a topic of study frequently during the last decades (Garbee, Zucker, & Selby, 1980; Polychronopoulou & Divaris, 2005; Alzahem et al., 2011). Most studies show that the dental school environment is particularly demanding for students with regard to examinations, clinical requirements, patients, financial problems, lack of time for relaxation, and faculty feedback or criticism. These dental school-related demands appear to be stable in time and region, since they have been reported by dental students since the 1980s until very recently, regardless of geographical position. Some studies indicate a difference in

experienced stress between preclinical and clinical years, whereas also sex differences are reported. These differences may vary per region or period.

A few studies have also picked up dental students’ burnout risk (Humphris et al., 2002; Pohlmann et al., 2005; Gorter R. et al., 2008). From these studies, it can be learned that while still at dental school, burnout risk is a serious phenomenon. From year one to graduation, there is a growing percentage of students that suffers from burnout risk. Some students try to cope with study stress by consuming cigarettes, alcohol, or drugs in alarming quantities. Even while at the relatively young age of a student, experienced stress was strongly related to physical complaints.

An important aspect with regard to dental student stress concerns its possible relation with future professional stress as a dentist. In fact, how one copes with stress at dental school may be indicative for how one copes with stress in dental practice. Studies that examine these relations are, however, scarce. Neither is much known about successful stress prevention or intervention at dental school. Rather than another examination of perceived stress factors during dental education, future research should focus on these relatively unexplored fields.

Burnout Prevention

In conclusion, when talking about burnout prevention, one always has to realize two things. First, there is usually no clarity about cause and effect; is a dentist exhausted because he always faces a full waiting room, or is this dentist already exhausted and therefore experiences his full waiting room to be a burden? Any adaptation should therefore be aimed at both the person and his environment. Secondly, there is no guaranteed success formula to extinct work stress. On the other hand, if a dentist structurally neglects obvious precautions, he should not be surprised to find himself seriously exhausted at some point in his career (Box 24.3).

Box 24.3. Stress and burnout prevention measures

Identification and acknowledgment of work demands. Although possibly too obvious, this is the starting point for stress prevention. Too often, family, friends, or even colleagues have given warning signs that a dentist appears to be under stress, that have been denied. All starts with the realization that work is too much demanding. Unfortunately, the professional culture in dentistry seems to take it for granted that always something extra should and will be done by the professional, and is not inviting for a dentist to openly express his worries about his own functioning.

Learning to relax. When a dentist is under pressure, his balance between demands and resources is disturbed, both physically and mentally, and often also socially. Learning to relax both inside and outside the work situation can bring great relief. In a physical sense, attention for one's posture while at work may reveal that one tends to structurally keep his muscles tight to fixate one's neck. Mentally, a change in interpretation of events can be very helpful; when a patient does not show up for an appointment, it usually frustrates a dentist, whereas this also can be embraced as a welcome moment to spend some time on other things, such as administration or a cup of coffee. And socially, in a busy practice, patient needs are prevailing, naturally. But paying attention to and taking measures for a good team spirit is equally necessary in order to function well (and prevent early staff dropout).

Time management and organization of work. In most dental curricula, traditionally, little to no time was reserved for practice management. In modern curricula, this aspect is getting some attention, although it will never be more than "an introduction to." Difficulties with practice management-related aspects of work is one of the key causes for experiencing work pressure among dentists. The positive side of this notion is that practice management difficulties are well solvable, if paid attention to.

Realistic professional expectations. Some dentists, keen on being a free entrepreneur, have become disappointed because of all the rules and regulations that exist in health care. Others, with the aim to help others in need, have become disillusioned because often patients do not show their gratitude, but instead, take all efforts for granted, or worse, are difficult when it comes to paying the bill. Working in a patient's mouth is different from tinkering

in a hobby room. Whereas perfectionism is a characteristic strongly present among dentists, in a dental practice, the perfect solution is often not the realistic one, frustratingly. Once again, attention for career expectations is highly underdeveloped in most dental curricula.

Social skills. Most modern curricula pay attention to dentist-patient communication skills. Ideally, this is done not only theoretically, but in communication skills practice courses where students receive professional feedback on their performance. Since dentistry is a profession in which communicating with—sometimes emotionally vulnerable—patients plays such an important role, also for graduated dentists, training one's skills is highly useful. And apart from the patient aspect, staff communication skills are also on the basis of good practice management.

Healthy lifestyle. Nothing is as an overworked subject as healthy lifestyle, when looking at stress prevention advice. But, nothing may be as effective either. Eating and drinking habits, physical exercise, nightly rest, breathing fresh air, taking time off, occasional change of routine, and so on. Any of these aspects, and more, do make a difference when it comes to balancing demands and resources.

Collegial contacts. In many practices around the world, dentists act alone, only supported by an assistant. Feedback from a colleague upon one's achievement is often missed. Patients may take excellent work for granted and will only respond when they have a complaint. Reflections upon how one plans his practice and his career, his future expectations, or how to deal with a patient, or staff member, are not shared by others. Especially younger, starting dentists would benefit from a regular consult with an experienced colleague, as a mentor providing feedback.

Dental schools. It was mentioned previously a few times already, but dental curricula can play an important role in burnout prevention. Paying attention to student stress while still at dental school may help an individual student learn how to cope with stressful situations. Practice management and patient communication skills are some aspects already mentioned that are decisive when it comes to being prepared for practice. Schools may also focus on these topics in their program for post-graduate education.

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25

Role of Dentists as Oral Physicians in Physical and Mental Health

Donald B. Giddon and Ruth Hertzman-Miller

Introduction

Dentists as a specialty of medicine are *de facto* oral physicians with principal responsibility for maintaining the structure and function of the mouth and surrounding orofacial area. Beyond providing dental care, dentists as oral physicians are expected to emphasize and integrate the relation between oral and systemic disease as contributors to overall health care and quality of life of their patients. As oral physicians, they need to recognize and reinforce their roles in mental health. Consistent with what is hopefully happening with other orofacial specialties, such as ophthalmology, ENT, proctology, gynecology, and urology, oral physicians are moving away from treating the hole in the patient toward treating the patient as a whole, in recognition of the increasing complexity of medical care for both young and aging patients. Among the greatest challenges to both patients and cli-

nicians are the many observable biophysical and/or psychosocial characteristics which can be observed or inferred from the face and mouth, including age, gender, speech patterns, race, ethnicity, nationality, intelligence, health, and disability. These characteristics are often biased and stereotyped by other people and can lead to adverse judgments.

The purpose of this chapter therefore is to make the case for dentists to accept their obligation to operate as *de facto* oral physicians and treat the mouth and surrounding areas as part of the body and mind of their patients.

Background

Sigmund Freud, the father of psychoanalysis and one of the first authors to describe psychosexual stages, described the early development

of an infant's worldview as centered first on the mouth as the source of pain and pleasure (Freud, 1961). Jean Piaget (Piaget 1952), in his seminal work *Origins of Intelligence in Children*, speaks of how an infant learns to distinguish objects accessible to the mouth from the mother or that which the child cannot devour which he then senses as the primordial basis of perception of self from others.

Consistent with Maslow's theory of the hierarchy of needs (Maslow, 1943), the mouth is also invested in satisfying psychosocial as well as physical needs. These include satisfying the basic needs for survival by intake of food, water, and socialization, as well as the more complex need for love; then the use of the speech apparatus of lips, tongue, teeth to communicate with family and friends allows the individual to achieve self-actualization and the enjoyment of the finer sensory pleasures of life, particularly those emanating from the oral cavity. Some psychoanalysts have suggested that the need for oral stimulation may in fact be instinctive and follow a rhythmic daily cycle (Friedman & Fisher, 1967).

It should not be surprising, therefore, that the morphology and function of the mouth also are essential to the development of a favorable body image which is vital to self-esteem. Perceived physical attractiveness appears to be based on a hierarchy of body parts, of which the face is foremost. While the eyes are the most important feature in judgments of attractiveness, the orofacial area is second (Hassebrauck, 1998). Therefore, adverse changes in either the structure or function of the orofacial area can be a major stressor. Social stressors can also cause psychoneuro-endocrinological changes resulting in problems for the orofacial area, for example, bruxism via the involuntary action of the somatic nervous system and halitosis which may have many etiologies, one of which is related to reduction in the volume of saliva or xerostomia due to the involuntary action of the sympathetic branch of the autonomic nervous system. Changes in the composition of saliva may also have direct and indirect effects as

markers of other psychiatric and medical disorders, for example, posttraumatic stress disorder (Young & Breslau, 2004), which can cause changes in salivary cortisol, epinephrine, and enzymes. There is some suggestion that one cause of orofacial birth defects such as cleft palate may be prenatal stress (Blomberg, 1980; Montenegro, Palomino, & Palomino, 1995). In addition, there are a number of other psychophysiological, stress-related diseases specific to the orofacial area, such as temporomandibular disorders, acute necrotizing ulcerative gingivitis (ANUG) (Giddon, Zackin, & Goldhaber, 1964), head and soft tissue pathology, eating disorders, bruxism, clenching or grinding, chronic cheekbiting, burning mouth syndrome, phantom tooth pain, lichen planus, and recurrent herpes labialis.

Several studies have indicated that physical attractiveness is understandably associated with personal and professional success, including educational opportunities and the choice of a life partner (Napoleon, Chassin, & Young, 1980; Alley & Hildebrandt, 1988).

As expected, however, there still may be differences among individuals in concern or emotional investment in the orofacial area (Franzoi & Shields, 1984). Not everyone wants to expend resources to improve the orofacial area, but may see a greater potential for enhancing self-esteem and quality of life by improving fitness and the appearance of the body. For example, males are more interested in the appearance of a woman's face when interested in long-term relationships, and conversely interested in the attractiveness of the body for short-term relationships (Confer, Periloux, & Buss, 2012). Although evolution suggests a correlation between the physical characteristics of the face and body, male and female judges were not able to match faces to nude bodies. Rather the judges simply matched the most attractive face to the most attractive body (Cruikshank et al., 2000); one explanation for this phenomenon is that females, more than males, are more likely in our culture to use makeup, hairstyle, and plastic surgery to alter perception of their faces.

Ethnocultural Differences in Perception of Appearance and Pain

As shown in recent years, there is considerable variation in the configuration and interpretation of ethnocultural differences in facial expression (H. Lee, Giddon, & Anderson, 2009). Since attitudes toward the mouth and illness behavior in general differ both within and between ethnocultural groups, the oral physician must have enough cultural competence to reduce reliance on stereotypes of responses to dysmorphia and pain (Giddon & Edwards, forthcoming).

Central to the understanding and management of patients from the ever-increasing pool of ethnoculturally diverse patients is recognizing the importance of communication between doctors and patients by being alert to disparities in health literacy (Nielsen-Bohlman & Institute of Medicine (U.S.). Committee on Health Literacy, 2004).

In general, ethnocultural variations in pain perception and reporting can profoundly influence diagnoses and treatment decisions (Mossey, 2011). There are also major differences among providers in the prevailing stereotypes about ethnocultural differences in pain perception, ranging from expressivity in some Mediterranean/Middle Eastern cultures (Zborowski, 1969) to nonexpressivity or stoicism, to macho behavior, where it's a matter of honor not to show pain, as seen in some Hispanic cultures (Torres, 1998). Stoicism can exist for several reasons; for example, the stoicism of Chinese and many other Asians is marked by a reluctance to report pain, preferring to keep it a private matter with minimal intrusion into the quality of life of family and others (Nilchaikovit, Hill, & Holland, 1993), while in some African cultures, stoicism is seen in religious rituals that require one to bear pain, for example, scarification. Dentists not practicing as oral physicians can be oblivious to these behavioral nuances which often result in under- or overtreatment for pain (Nilchaikovit et al., 1993).

As one important example of the ethnocultural differences in provider awareness, clinicians in a labor and delivery unit in Israel (most of whom were Jewish) perceived Bedouin women as experiencing less pain than Jewish women, even though the women themselves—all of whom received similar treatment—assessed their pain as similar, thereby reinforcing the existence of culturally different interpretations of pain (Sheiner et al., 1999).

Although many health professionals chose dentistry over medicine because they wanted to avoid the bureaucracy and the concern about life and death decisions, mortality is not alien to the dental world (Otto, 2007), for example, deaths from outpatient anesthesia (1 in approximately 1.7 million) (D'Eramo, Bontempi, & Howard, 2008), the infamous death cited by Daschle (Daschle, 2008), and some deaths due to wisdom tooth surgery (Moisse, 2011).

The Oral Physician and Access to Dental Care

For the benefit of both patients and clinicians, it is also important for oral physicians and other healthcare providers who are entrusted with the integrity of the healthcare system to identify patients who overutilize the system, whether intentionally or not. Their conscious or unconscious motivations may vary from feeding a drug addiction through malingering to psychopathology (Williams et al., 2001). For example, Wasan, Anderson, and Giddon found that those patients with left-lateralized spinal pain have more psychopathology than those with right-lateralized pain (Wasan, Anderson, & Giddon, 2010).

There is in fact a public outcry about the disparities in access to affordable dental care, so much so that dental care is now one of the most sought-after worker benefits (American Dental Association, 2012a). This concern and interest has been highlighted by the recognition of the interrelation of oral and systemic disease, and realization of the orofacial manifestations of

over 100 systemic diseases, some of which have a genetic basis (Long, Hlousek, & Doyle, 1998; Ward, Jamison, & Allanson, 2000; Smithson & Winter, 2004).

Role of Dentists as Oral Physicians in the Healthcare System

Dentists as oral physicians need to recognize and respond to having a greater role in the healthcare system.

In addition to being available as first and follow-up responders under the Pandemic and All-Hazards Preparedness Reauthorization Act of 2013 (H.R. 307, 2013), some of the general health issues which dentists are already trained to recognize and refer for include cardiovascular disease, hypertension, osteoporosis, skin cancer, nutrition, and tobacco cessation counseling. Recognition and treatment of the dental ravages of eating disorders such as bulimia are yet another mental dental connection (Tran, Anderson, & Giddon, 1998; Anderson, Zionic, & Giddon, 2002; Giddon & Anderson, 2002), as is relating facial trauma to domestic abuse.

As important as some of these concerns may be for practice, the present predoctoral or even postdoctoral curricula may not yet provide sufficient training to recognize and manage as oral physicians the psychosocial issues other than awareness of the oral manifestations of psychoactive and other medications across the age spectrum.

Historically, a dentist would only diagnose and treat the teeth and supportive structures. In relatively recent years, the scope of practice nationally has broadened. The ADA now accredits postdoctoral programs that “. . . prepare graduates to act as a primary care provider for individuals with chronic, recurrent and medically related disorders of the oral and maxillofacial region and to provide consultative services to physicians and dentists treating patients with chronic, recurrent and medically

related disorders of the oral and maxillofacial region” (American Dental Association, 2012b). Participation in such programs reflects a greater understanding of the mouth, of which there may be one anatomical side and one political side, as part of the body and its relation to self-image and esteem and therefore critical to overall physical and mental health and quality of life.

Dentists are probably overtrained for what they actually do. Therefore, just taking advantage of dentists’ existing capabilities as *de facto* oral physicians can facilitate their being able to provide limited preventive primary care by utilizing the time saved by delegating routine procedures to mid-level providers such as dental therapists or hygienists (Anon, 2012).

One of the efforts to move dentists back in the direction of medicine was the change in dental degree from DDS to DMD for schools with a significant medical component in their predoctoral curricula. While Harvard, the University of Louisville, and the University of Oregon may have been the first to change the degree, many other schools have since followed, but not necessarily with the same emphasis on medicine. Although training varies from school to school, regardless of whether the degree granted is DMD or DDS, public perception is that the DMD is more competent than the DDS to deal with the medical issues associated with dental care (Lalumandier, Pyle, & Sawyer, 1999), and many graduates of DDS programs, when given the option to change their degree to DMD do so, even at additional personal expense. Moreover, for those with the more preferred DMD degree, the fact that medicine is part of the degree awarded should allow such degree recipients to be called physicians.

Factors Facilitating Dentists Becoming Oral Physicians

Some of the factors influencing the changes are as follows.

Use of Mid-Level Providers

In spite of evidence (Emmerling & Standley, 2011; Beazoglou et al., 2012) that properly trained nondentists can be employed to increase access at lower cost to dental care, the dental profession is resisting allowing mid-level providers, such as the new dental therapists in the United States, to treat patients requiring only simple restorations or emergency care. After unsuccessful legal battles by organized dentistry in which they maintained that these mid-level providers would be practicing dentistry without a license, dental therapists are now being trained under the auspices of the Alaska Native Tribal Health Consortium which is authorized to act on behalf of sovereign tribal nations in lieu of the U.S. government's Indian Health Service (Halliday, 2007).

Time Saved for Primary Care by Using Mid-Level Providers

Although some authors disagree (Beazoglou et al., 2012), Giddon, Swann, & Hertzman-Miller (2012) have maintained that the time saved by such delegation to mid-level providers will allow the dentist as an oral physician to provide limited preventive primary care, including screening for chronic disease based on oral and systemic manifestations of disease and taking of vital signs (Giddon & Swann, 2011). Whether the dental profession approves or not, these mid-level providers will become a major source of dental manpower (Bertolami, 2011; Giddon et al., 2013).

Dentists Need a New Superordinate Designation as Oral Physicians

Mid-level providers/dental therapists will be called dentists, and this perception will likely become so pervasive that the public and/or patients will not be willing or even able to distinguish these mid-level providers from the medically and surgically trained dentists.

Rather than viewing the development of mid-level providers as a threat, the dentists should see them as an opportunity to reinvent themselves as oral physicians who will oversee all dental care, whether provided by dentists or nondentists. In fact, a bill has been brought before the Massachusetts legislature that would allow dentists to designate themselves as oral physicians (Bill H01490, Massachusetts Legislature, Joint Committee on Public Health, 2011), similar to what was already permitted for podiatrists and chiropractors: to become podiatric and chiropractic physicians, respectively.

Relative Shortages of Access to Lower Cost Dental Care and Primary Care Providers

As noted earlier, the limited access to affordable dental care (IOM (Institute of Medicine) and NRC (National Research Council), 2011) and the widely recognized shortage of primary care physicians (Julian, Riegels, & Baron, 2011) set the stage for a redistribution of the dental healthcare workforce. In this new system, the dentists, in addition to providing dental care which only they can provide, can also by delegation to mid-level providers be available as oral physicians to provide limited preventive primary care.

Medical and Surgical Training of Dentists

Training to become a dentist includes basic didactic and clinical skills in medicine and surgery sufficient to provide limited primary preventive care, such as obtaining vital signs, screening for chronic disease, including recognition of major psychiatric and behavior disorders.

Public Acceptance of Dentists as Oral Physicians

There are a number of studies showing that patients will accept dentists becoming involved

in overall health as oral physicians. Although dentists often claim that patients will not allow them to provide any services other than those directly related to the teeth, several studies and other sources suggest that patients do appreciate such interest in their overall welfare (Greenberg et al., 2009) and are willing to pay a small fee to dentists (as oral physicians) for such a service (Greenberg et al., 2012). In the United Kingdom, for example, patients welcome dentists' being concerned or even obligated to know more about general health (Hancocks, 2012). Some of the preventive services patients are beginning to welcome involve screening, including for tobacco use (Campbell, Sletten, & Petty, 1999; Victoroff et al., 2006), alcohol use (Miller et al., 2006), HIV (Blackstock et al., 2010), diabetes, and cardiovascular risk (Greenberg et al., 2007). In general, patients support being asked about domestic violence by healthcare professionals (Caralis & Musialowski, 1997; Feder et al., 2006), and in one study, the majority of survivors of domestic violence wanted their dentists to ask about the source of their injuries (Nelms et al., 2009).

Dental clinic patients have also indicated their willingness to have their dentists ask about and/or screen for important systemic illnesses, including cancer, heart disease, diabetes mellitus, HIV, hepatitis, obesity and nutritional status, psychological disorders, domestic abuse, and hypertension (Greenberg et al., 2009; Giddon et al., 2012), and this willingness appears to be associated with reporting themselves as having a particular medical condition, although whether or not they actually have the medical condition has yet to be determined (Berry, 2012).

Dentists Seen More Regularly Than Physicians

The dentist is seen on a more regular basis than the primary care or family physician (Strauss et al., 2012) and, except for emergencies, dental care is generally elective, compared to most medical care which is inelastic and on an as-needed basis.

Training of Oral Physicians

Harvard University recently funded a program to train general practice dental residents to become oral physicians. Working with Harvard Medical School, Harvard School of Dental Medicine, and the Cambridge Health Alliance, they are also cross-training with medical residents to learn more about oral health and disease (Giddon, 2010). Related to this effort, the Harvard Medical School curriculum now includes presentations on oral health and the prevention of oral disease (B. Swann, 2012, personal communication). Although there has been a significant recognition of the importance of interprofessional collaboration (Institute of Medicine, 2013), including the medical home concept, among health providers, there have been some obstacles or impediments to implementation. For example, the issue of what care dentists can or should provide was raised recently in legislation proposed in Illinois by the Illinois State Dental Society to allow dentists to give vaccinations, including flu vaccines, but was withdrawn partly because of opposition by the Illinois State Medical Society (Fox, 2013).

Dentists Becoming More Comfortable with Role in Primary Care

Dentists, particularly those in academic leadership positions, are becoming more supportive of taking a role in primary care. A recent survey of U.S. dentists revealed that "[t]he majority thought it was important for dentists to conduct screening for hypertension (85.8%), cardiovascular disease (76.8%), diabetes mellitus (76.6%), hepatitis (71.5%) and human immunodeficiency virus infection (68.8%)" (Greenberg et al., 2010). Some of these opportunities already exist; for example, screening for diseases that can be diagnosed from saliva or other oral fluids or tissue samples (Lee, Garon, & Wong, 2009), which currently include HIV, hepatitis C, and diabetes, and in the future may include markers to identify the presence of breast, gastric, lung, and possibly prostate cancer, among others

(Drobnik et al., 2011; Gaidos, 2011; Giddon & Lisanti, 1962; Y. H. Lee & Wong, 2009; Yeh et al., 2010). Dentists' ability to screen for psychiatric disorders, such as bipolar disorder (Deshauer et al., 2003), has also progressed over the years since the work of Giddon and Lisanti (Giddon & Lisanti, 1962). If the dentists as oral physicians do not take advantage of the many still untapped opportunities in their own domain of salivary assays, physicians and other health professionals certainly will.

Past and present screening by dentists for socio-medical problems include 42% of dentists who report that they already screen patients for eating disorders (Debate & Tedesco, 2006), 15% who sometimes or often screen for domestic violence at checkups, and 82% who ask about domestic violence when presented with head or neck injuries (Love et al., 2001).

Obligation of Health Professionals

Although there is some reluctance to be intrusive, dentists in general report being comfortable with their roles as mandated reporters of domestic violence (Barbara Aved Associates, 2006). The license to practice dentistry is not an entitlement but a privilege granted by the government to serve society as a health professional.

Compensation of Dentists for Nondental Health Services

Except for counseling for tobacco cessation, compensation for these additional services is not readily available. Some other conditions for which Medicare and other third-party payers may be able to compensate dentists/oral physicians, and for which there are already billing codes, are obesity and drug addiction. Given that dentists are the number two prescribers of narcotics (Denisco et al., 2011), they should have a significant role in recognition of addiction, helping patients to receive appropriate treatment. Brief addiction counseling, which has shown to be effective in general medical set-

tings, could be applied successfully by dentists practicing as oral physicians.

Some insurance companies are already compensating dentists for dental and other preventive procedures (Anon, 2010; Delta Dental of Massachusetts, 2009). Thus, it may not be too long before preventive primary medical care services are covered regardless of the provider. Although primary care physicians may see the potential benefit of having dentists provide limited preventive primary care, they have to reconcile their lesser net compensation with that of dentists (Berenson, 2007).

Deterrents to Becoming Oral Physicians

1. Maintaining successful business model. Organized dentistry is determined to maintain its successful business model, which does not require being accountable to third parties for treatment cost or appropriateness, except for hospital procedures.
2. The public will be confused by these dual designations, yet they are already confused by the DMD and DDS degrees (Lalumandier et al., 1999).
3. Dentists have been this way for hundreds of years, so why fix it, if it is not broken.
4. Although dentists are healthcare professionals, they are trained in dental schools and not medical schools.
5. Dentists are licensed and regulated by the Board of Registration in Dentistry, not the Board of Registration in Medicine (Massachusetts Dental Society, 2007).
6. Dentists are not sufficiently trained in medicine to take on expanded primary care functions.
7. The motivation and culture of dentists is different from that of physicians (Formicola, 2002).

What Can and Should Be Done

Realistically, what can or should be done for dentists to broaden their scope of practice to

include limited preventive primary care? The scope of practice in most states already allows dentists to provide or oversee whatever health care is essential for dental treatment, including knowledge of the oral and systemic effects of medications administered by the dentist and other providers (Neeley, Kluemper, & Hays, 2006). Without assuming the superordinate designation as oral physicians, some specialties, such as the periodontists, orthodontists, pediatric, and public health dentists, are already functioning as oral physicians. Periodontists continue to emphasize the interrelationship between oral and systemic disease, diabetes and its association with periodontitis being a prime example (Campus et al., 2005; Lalla et al., 2011). Periodontists' greater awareness of systemic disease increases the probability of being able to diagnose systemic disease by clinical examination and evaluation of oral secretions (Segal & Wong, 2008). Periodontitis has also been implicated in coronary artery disease, structural heart disease, and preterm delivery (American Academy of Periodontology, 2000b). Depression (Rosania et al., 2009), obesity, and compromised immunocompetence, among other disorders, have been associated with periodontal disease (American Academy of Periodontology, 2000a; Formicola et al., 2008).

The orthodontists are in the unique position of seeing their patients once a month for 2 years during their most formative years. As part of these visits they should be able to recognize developmental, mental, and physical disorders, including craniofacial anomalies and oral manifestations of medications for mental and physical disease, autistic spectrum disorders (Berman, 2010; Lainhart et al., 2006) and attention deficit-hyperactivity disorder. Orthodontists should be especially sensitive to the mental health needs of young patients, whose primary motivation is probably for esthetic rather than functional reasons (Baldwin, 1980).

Pediatric dentists working with pediatricians are often able to see the earliest signs of autistic spectrum disorders as well as developmental and other mental and physical disorders

(Berman). Psychiatric disorders such as personality disorders and associated behavioral problems often present early enough for pediatric dentists or orthodontists to recognize and refer as appropriate.

Public health dentists continue to be supportive of the oral physician concept, with efforts to provide access to low cost treatment of dental disease as one of the persistent acute and chronic problems affecting mankind.

All healthcare providers, including dentists as oral physicians, have to be continually alert to the risk of suicide, particularly among their younger patients. In fact, in one survey of orthodontists, 50% reported a suicide attempt by a patient in their practices (Loochtan & Cole, 1991).

Adding basic primary care screening to dentists' practices can serve two important preventive functions: primary prevention by early diagnosis and secondary prevention by treatment to prevent spread of disease.

Although preventive screening for systemic diseases is within the educational and practice scope of dentists as oral physicians, treatment of these diseases, and even in some cases post-test counseling (such as that for a patient with a positive HIV test), requires additional training beyond that provided in existing pre and post-doctoral curricula. Dentists are well positioned to be a first line of screening, but should not be expected to provide regular care other than monitoring compliance with prescribed medications and their oral manifestations. Nevertheless, dentists as oral physicians can and should have a significant role in providing primary care (Lamster & Formicola, 2011) (Table 25.1).

Primary Prevention: Lifestyle Counseling

Identifying lifestyle risk factors for alcohol problems, smoking, and obesity is one important task that dentists as oral physicians can contribute to overall health and lifestyle. In one emergency dental clinic, heavy alcohol use was found in one-fourth of patients (Miller et al., 2006). Similarly, in a university-based dental

Table 25.1 Present and proposed primary care functions.

Screening for, recognizing, and referring for physical and mental conditions, including

- Hypertension, cardiovascular, and cerebrovascular disease
- Diabetes
- Developmental disorders
- Osteoporosis
- Oral manifestations of systemic disease and medications
- Eating disorders, substance and child/domestic abuse
- Oral and skin cancer of head, neck, and hands
- Nutritional counseling
- Tobacco cessation counseling
- Attention deficit hyperactivity disorder
- Depression
- Autism

Being available for triage and administering vaccines and other oral and systemic medications during bioterrorism and other disasters

clinic it was found that 29% of patients smoked (Victoroff et al., 2006). With 69% of the U.S. population considered to be overweight or obese (FDA/NIH, 2000), it was not unexpected to find in one study in an oral surgery clinic that the prevalence of overweight and obesity was 65% (Marciani, Raezer, & Marciani, 2004). Because brief counseling has been demonstrated to improve outcomes for patients with alcohol (Kaner et al., 2007) and smoking addiction (Stead, Bergson, & Lancaster, 2008), dentists in their role as oral physicians should continue to be alert to patients seeking help with alcohol, drug, or smoking problems. Although evidence for the effectiveness of brief counseling for obesity is less clear (Peterson, 2007), more extensive counseling is clearly associated with improvement (Armstrong et al., 2011). It is obviously important to be able to explain that all of these problems have an impact on both oral and general health.

Secondary Prevention: Early Diagnosis and Treatment

As noted earlier, there are several demonstrated examples of specific diseases in which screening in the dental office can improve rates of early diagnosis, including cardiovascular disease and diabetes. For example, both national clinic-

based surveys reveal that among adult dental patients who reported no cardiac risk factors, 18% had a 10-year cardiac risk of >10% (Glick & Greenberg, 2005; Greenberg et al., 2007). Twenty-eight percent of patients who did not report risk factors had undiagnosed hypertension, and 45% of the men had low HDL levels. Glucose screening in a dental clinic revealed that 7% of patients had previously undiagnosed diabetes (Harrison, 2011; Lalla et al., 2011). Detection of these undiagnosed systemic diseases by dentists as oral physicians, and subsequent treatment in a primary care setting, would contribute substantially to lowering morbidity and mortality of these patients.

Using HIV as an example, both primary and secondary prevention can reduce morbidity and mortality, although health professionals are reluctant to be in contact with the saliva or other bodily fluids of HIV patients. Accordingly, the U.S. Centers for Disease Control recommends routine HIV screening of all sexually active adults. Although HIV screening can readily be done in the dental setting (Nassry et al., 2012), it is not yet clear if undiagnosed HIV is sufficiently prevalent in this setting to warrant routine screening. For example, one study in New York City screened 3565 previously undiagnosed individuals presenting to a dental

clinic and detected only 19 new cases of HIV (Blackstock et al., 2010).

Mental Health and Behavioral Screening

Similarly, dentists should have a role in identifying mentally ill patients. Although most dentists agree that they have encountered patients with mental illness, they feel that they are not trained to recognize, let alone treat such problems, except to refer the patients to other health professionals (Lloyd-Williams et al., 2001). To the extent that such problems may interfere with diagnosis and treatment, it is important that dentists as oral physicians be able to recognize many of the signs and symptoms of depression, schizophrenia, attention deficit hyperactivity, bipolar or borderline personality disorder, and most likely, patients with body dysmorphic disorder, which can be very difficult for clinicians to manage. Although rare, body dysmorphic disorder can totally disrupt a practice because of the unreasonable fixation on a part of the body, usually in the face. Further evidence of the need for dentists to be concerned with mental illness was found in a dental school clinic, where 26.8% of patient histories revealed at least one mental illness. Moreover, among all diseases reported in patient histories, depression was only second to hypertension (Woods, 2003). In another study 20% of patients had a psychiatric illness, again with depression being the most frequent (Giglio & Laskin, 2010).

As noted earlier, consideration should also be given to the effects on behavior and manifestations of a number of systemically active medications prescribed for comorbid psychiatric and pain-related conditions, such as pain and psychopathology, and side effects of psychoactive agents (Neeley et al., 2006; Becker, 2008), including (1) the basic classes: tricyclics, SSRIs, anticonvulsant mood stabilizers, stimulants, first- and second-generation antipsychotics; (2) the generic names of these medications; and (3) typical side effects, such as xerostomia, hypotension, weight gain, sedation, akathisia, tremor, GI upset.

In addition to preventing or controlling pain, dentists as oral physicians have been employing successfully a combination of behavioral and pharmacological methods to reduce anxiety, phobias, and fear of dental treatment, and other equally important psychological problems related to loss or locus of control (Logan et al., 1991), depression/melancholy about loss of teeth (Sosnow, 1962), dissatisfaction/displeasure with dentures, and consequent reduction in satisfactory social interaction (Clay, 2000).

Although the dental manifestations of anorexia and bulimia may be obvious, the willingness of dentists to explore with patients and even their families the more covert aspects of these disorders is problematic, even for dentists as oral physicians. Women with eating disorders are often quite concerned about their oral health, although they may not tell the dentist about their eating disorder in the absence of direct and sensitive questioning (Willumsen & Graugaard, 2005). Therefore, dentists as oral physicians have an opportunity, almost an obligation, to participate in the management of the up to 5% of the population with eating disorders, such as bulimia. Eating disorders have a wide range of pathophysiological and psychological effects, the most severe being anorexia, which can lead to death. Because access to the oral and other signs and symptoms of these eating disorders should be part of the dental (including parotid glands) examination, and possibly observable changes in the skin, screening for eating disorders therefore should be some part of the preventive primary care evaluation repertoire.

Although acknowledging their role, dentists are reluctant to report obvious trauma as being the result of physical abuse, claiming that they are not comfortable with providing personal information about nondentally related issues, not to mention that they are not being compensated. As training is rarely provided for dentists, compliance with mandated reporting of domestic and child abuse is likely low (Harris et al., 2009) but can be increased as much as fivefold with appropriate training (Delta Dental of New Jersey, 2012).

Recently, much attention has been focused on the role of human papillomavirus (HPV) in head and neck cancers Upile et al. (2012). There is evidence that oral transmission of HPV is related in part to oral sex (Edelstein et al., 2012; Gillison et al., 2012). This link highlights “the necessity for all dentists to ask the tough and personal questions regarding sexual practices that involve the oral cavity and the systemic relationship. When you approach the patient from the oral physician perspective, you come across as a ‘doctor’ and the environment takes on a different attitude. The provider needs to create this ‘space’ in order to appreciate and validate the professionalism in this type encounter” (Brian Swann, DDS, personal communication).

Finally, the development of a good business model, built on their demonstrated success over many years, to incorporate these expanded responsibilities for medical screening and limited primary preventive care will help to facilitate dentists becoming oral physicians.

Summary

The changes in dental care that accompany the reorganizing of the healthcare workforce should not be seen as a threat to dentists, but rather as an opportunity to reinvent themselves as other health professionals, such as pharmacists, podiatrists, and chiropractors have done. Dentists may benefit both themselves and the public by being designated as oral physicians. These oral physicians can then be responsible for limited preventive primary physical and mental health care, taking responsibility for overseeing all dental care, whether provided by a dentist or nondentist.

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Appendix

Brief Relaxation Training Procedure for Use in Dentistry

Ronald W. Botto

Introduction

Before doing any relaxation training with your patient, it is very important that you establish good rapport with your patient. Good rapport is essential to creating positive expectations and confidence in the technique, as well as a willingness to cooperate. All of these factors enhance the success of the relaxation.

In the process of establishing rapport, you need to create positive expectations by giving the patient positive suggestions. If you accomplish this first phase of positive expectations successfully, the patient should be successful in achieving an increased level of relaxation.

When establishing rapport, explain the following carefully:

1. The general usefulness of learning this technique, that is, that this will be something that can be used at *any* time to relax, for example, if there are problems while sleeping, if tense during the day, or while performing a stressful task.
2. This can make the dental procedures more pleasant and decrease discomfort. (NB: You must be very careful that you do *not* say that the patient “will not feel pain,” but instead that “you will feel much more relaxed and comfortable.”)
3. What will generally be occurring, for example, “you will be sitting in the chair and slowly relaxing different muscles in your body one at a time so that when you finish, all your muscles will be relaxed and you will be very calm, comfortable and in control.”
4. It is important to emphasize that the *patient* controls the success of the procedure. All you are doing is serving as a guide and suggesting which muscles to relax and when. The patient decides whether or not he/she

will gain increased control over the situation and his/her emotions. Emphasize that relaxation is a learned skill, and once the patient learns it he/she will be able to use it on his/her own.

5. Has the patient had any prior experience with relaxation and, if so, what? If the experience was positive, suggest either the patient use their own relaxation or, preferably (so you can enhance the relaxation effect), that you will teach them an alternative one that they can use as well. If the experience was negative, find out what made it negative or not successful, and tell them that if they are willing to work with you on this, you can help them make it a positive experience. If the patient has had negative or uncomfortable experiences, or is reluctant to experience relaxation, do not force it on the patient. Suggest that they use an alternative method, or, if none is feasible (e.g., patient is fearful of losing control and you cannot allay that fear), you may need to refer the patient to a mental health practitioner to learn to deal with their dental apprehension.
6. Ask the patient to describe a relaxing place and season, for example, a beach by the ocean in the summer or a lake in the woods in the fall. Use this scene for the mental imagery at the end of the relaxation. Remember to appeal to as many senses as possible, for example, touch, hearing, seeing, and smelling. Tell the patient that by concentrating on this picture he/she will be able to stay calm, controlled, and relaxed throughout the procedure.
7. Determine if there is any particular place on the body that the patient tends to feel tension (e.g., neck, stomach, shoulders), and emphasize that part of the body during the relaxation.
8. Give the patient a signal to use (e.g., hand opposite you raised) if they wish to communicate during the dental procedure. This will also give the patient a sense of control, which will help reduce anxiety.

Once you have the patient relaxed, do not arouse him/her prior to the dental procedure. Also, do not ask the patient unnecessary questions. Leave the patient relaxed for your dental procedure and then when you are completely finished with your dental work, you may reverse the relaxation, if necessary. It is preferable that you are prepared to begin your dental procedures as soon as you complete the relaxation. Also, it is important that you let the patient know what they will be experiencing so there are no surprises (e.g., "you will be tasting some cherry flavored gel to make your gums numb" or "you will be feeling a slight pinch, so take a deep breath and hold it while I give you the anesthesia").

The suggestions given after the progressive relaxation are just as important as the suggestions given prior to the relaxation procedure. You will find that when relaxed, patients are generally responsive to suggestions. Therefore, you should use this to your advantage by suggesting to your patients the following:

1. That they will be able to remain relaxed throughout the dental procedures.
2. They will be able to stay calm, controlled, and comfortable.
3. They will be able to concentrate on keeping their body relaxed, and if they feel tension in any part of their body at any time, release it, relax their muscles, and breathe deeply and slowly twice. *Note:* In order to reduce the chances of the patient accidentally aspirating foreign matter, tell the patient to breathe through their nose.
4. Furthermore, after giving suggestions of continued relaxation, give your patients a mental image of a relaxing scene to concentrate on during the procedure. In creating this image, use the patient's scene and "paint" a mental picture for your patients and appeal to as many of the senses as possible.

During those parts of the dental procedure that your patients consider especially stressful (e.g., injections or radiographs), you should employ distraction techniques as well. These

can be a continuation of the mental picture, or, if your patients seem to be having difficulty concentrating, something more physical such as breath control.

During the stressor, continue to give positive suggestions such as "You are doing fine" and "You are in complete control." Following the stressor, the relaxation should be reinforced by simply repeating the relaxation suggestions once, from the head down, and repeating the positive suggestions of staying relaxed. Prior to beginning relaxation, make sure

1. You have made all necessary preparations so that following the relaxation you can go directly into your dental procedures without delay.
2. The patient is draped.
3. The chair is in the approximate position necessary for dental work, so there is minimal, if any, chair adjustment following relaxation. (NB: When initially talking to the patient, have chair upright and only lower it when beginning relaxation.)
4. During relaxation, watch the patient for signs of compliance, for example, tensing feet, breathing deeply. If the patient does not comply, supplement instructions, for example, tell the patient to push their toes against the bottom of their shoes, tell the patient to take a full deep breath, then tell him/her to let it out slowly and repeat the suggestion. (NB: It is *very* important that the patient comply with deep diaphragmatic breathing when asked to breathe "deep and slow." Doing so induces physiological relaxation through the parasympathetic nervous system.

Brief Relaxation Procedure Script

(The following can be read to the patient since they will have their eyes closed)

[Rapport]

"First of all, I would like you to try and get as relaxed as you possibly can. Just lie back in

the chair, close your eyes while I talk, and get as relaxed as possible so you can compare how relaxed you are now with how much more relaxed you will become when we are finished."

"Before beginning the relaxation procedure, there are a few things that I would like to tell you." (NB: If the procedure is being recorded, add the following statement at this point, otherwise, go to the next paragraph ("Learning to relax . . ."): "If, while you are listening to this recording, and anything occurs that requires your attention, you will be able to stop the relaxation, and deal with whatever is occurring very quickly and easily. If anything occurs that requires your attention, you can stop the relaxation, and deal with it quickly and easily. Otherwise, if nothing requires your attention, I would like you to remain relaxed and comfortable until we are done. This is time for you to relax.")

"Learning to relax is like learning any other skill; the more you practice, the better you become. You will find that as a result of being more calm and at ease, you gain more control over yourself and the situation. As a result of the control gained from relaxation, people who practice relaxation regularly are often found to have a better outlook on life and are less prone to many of the disabilities that result from everyday stress such as heart attacks, high blood pressure, and ulcers. You are better able to deal with many potentially stressful situations."

"Various aspects of this procedure are employed in a wide variety of medical, psychological, and dental situations, and generally increase patient control and comfort during procedures that are otherwise found bothersome. As you can see, there are a variety of benefits to be gained from relaxation. Thus, the more you practice relaxation, the better you become, so that whenever you are feeling anxious you will be able to take 5 or 10 minutes out, sit back, practice relaxation and find yourself more in control and better able to deal with the situation."

"I am interested in showing you today just how helpful relaxation is in gaining control and reducing your anxiety. Therefore, when I ask you to relax shortly, I would like you to concentrate on relaxing so that you may fully experience the calmness that will follow and remain throughout your visit. As you will find, you will be able to remain calm, controlled, and comfortable as a result of being relaxed."

"It is important to remember that you are relaxing yourself. You have the choice of how relaxed you allow yourself to become. All I am doing is serving as a guide for you. How relaxed you allow yourself to become is totally dependent on you. Sometimes it is hard to keep your mind on relaxing. Therefore, should other thoughts come into your mind, simply let them pass through your mind and sit back and watch them as if you are watching slides on a screen or a boring TV show. Just observe your thoughts rather than think about them. Sometimes it is helpful to repeat my words to yourself. Since all relaxation is self-relaxation, and I am simply your guide and you control the level of relaxation you achieve, repeating my words to yourself can be very helpful. Do whatever is necessary to concentrate on what I am saying so that you may relax fully."

"As mentioned earlier, with relaxation, the more you allow yourself to relax now, the more controlled and relaxed you will be during your visit. By becoming relaxed, you gain control over your thoughts, and therefore your actions and feelings. It is important that you get as relaxed as you possibly can so that you may fully experience what it feels like to gain control over your thoughts, and therefore your feelings and behaviors, and maintain relaxation during your visit. By carefully concentrating on relaxation and allowing it to be complete you will be able to experience the greatest level of control and relaxation throughout the entire visit."

[Relaxation]:

"I would like you to continue to relax by getting a relaxing picture in your mind. I'd like you to picture yourself lying in a nice large tub of warm water in a sunny bathroom. Maybe one

of those old-fashioned tubs with the claw feet that you can fill all the way up to the top with nice warm water. Feel the sensation of the warm water all around you. The sun is shining through the window, and the water smells clean and fresh. Now imagine pulling the plug out of the drain, and feeling the water drain down around your body. Just as the water drains down around your body and away, you will feel the tension draining down from your body, down and away."

"The first muscles I would like you to think about are the muscles of your feet. To see the contrast between tension and relaxation, I would like you to now tense the muscles in your feet. Tense them up, tense them . . . tense them . . . now relax them. Relax them and feel the contrast between the tension and the relaxation. All right, let's do that again. Tense the muscles in your feet . . . tense them . . . tense them . . . now relax them. Let them go totally limp; totally, completely limp; and feel the tension drain down . . . down from your feet, down and away."

"In a moment, I'm going to ask you to take a deep, slow breath, and when I do, I want you to breath in as deeply and slowly as you possibly can, and hold your breath until I tell you to let it out. OK, now take a very deep, very slow breath . . . very deep . . . hold it . . ."

[Watch the patient and make sure he/she takes a deep breath.]

". . . now let it out very slowly . . . all right, do that again, breathe deep . . ."

[Watch the patient and make sure he/she takes a deep breath.]

". . . and let it out slowly. . . ."

"Feeling relaxed and comfortable, relaxed and at ease, calm, controlled, and relaxed."

"Now think about the muscles in your legs, your lower legs and your upper legs. Don't tense them, just think about the muscles in your legs and any tension in them. Think about them, think about them, and now relax them. Relax them. Release the tension and feel it draining down . . . down from your legs . . . down from your feet . . . down and away. All the tension draining down, draining away. Letting your

muscles go limp, limp, heavy and limp. Breathing deep . . . and slow. Deep . . . and slow. Feeling relaxed and comfortable, relaxed and at ease, calm, controlled, relaxed, and at ease."

"Now think about the muscles in your back and shoulders. Concentrate on the muscles in your lower and upper back, your shoulders, and any tension in them. Think about them, think about them, and now relax them. Relax them and feel the tension draining down . . . down from your shoulders and back . . . down from your legs . . . down from your feet . . . down and away. All the tension draining down, draining away. Letting your muscles go limp, limp, heavy and limp. Breathing deep . . . and slow. Deep . . . and slow. Feeling relaxed and comfortable; relaxed and at ease; calm, controlled, relaxed, and at ease. By being relaxed, you have better control over your thoughts, feelings, and actions."

"Now think about the muscles in your stomach and your chest. Concentrate on the muscles in your stomach and chest and the tension in them. Think about them . . . think about them . . . and now relax them. Relax them. Release the tension and feel it draining down . . . down from your chest and stomach . . . down from your shoulders and back . . . down from your legs and feet . . . down and away. All the tension draining down, draining away. Letting your muscles go limp, limp, heavy and limp. Breathing deep . . . and slow. Deep . . . and slow. Feeling very relaxed; very comfortable; very calm, controlled, relaxed, and at ease."

"Now concentrate on the muscles in your arms and your hands. Concentrate on all the muscles in your hands and arms, in your fingers, your palms, your forearms, your upper arms. Concentrate on these muscles and any tension in them. Think about them . . . think about them . . . and now relax them. Relax them completely, and feel the tension draining down . . . down from your hands and arms . . . down from your chest and stomach . . . down from your shoulders and back . . . down from your legs and feet . . . down and away. All the tension draining down . . . draining away. Letting your muscles go limp, limp, heavy and limp. Breathing deep

. . . and slow. Deep . . . and slow. Feeling very relaxed; very comfortable; very calm, controlled, relaxed, and at ease. The more relaxed you are, the more control you have over your thoughts, feelings, and actions."

"Finally, think about the muscles in your forehead, your eyelids, your jaw and your neck. Think about these muscles and any tension in them. Think about them, think about them, and now relax them. Relax them completely. Relax them, and feel the tension draining down . . . down from your head and neck . . . down from your hands and arms . . . down from your chest and stomach . . . down from your shoulders and back . . . down from your legs and feet . . . down and away. Feel all the tension draining down . . . down and away. All the tension draining down . . . draining away. Letting your muscles go limp, limp, heavy and limp. Breathing deep . . . and slow. Deep . . . and slow. Feeling very relaxed; very comfortable; very calm, controlled, relaxed, and at ease."

[Suggestions]:

"That's good, that's fine. You've done very well. You are very relaxed now. Just see how much more comfortable and relaxed you are now than just a couple of minutes ago, and by being relaxed, how much more control you have over your body, mind, and thoughts. By being this relaxed, you can control your thoughts, and therefore your feelings and actions better than ever before. I want you to take one more deep slow breath, and if there is any tension left anywhere in your body, release it and let it drain down and away. That's it, all the tension in your body draining down, draining away. All the muscles in your body totally limp, limp and relaxed, heavy and limp. Breathing very deep . . . and very slow. Very deep . . . and very slow. Feeling very relaxed; very comfortable; very calm, controlled, relaxed, and at ease."

"Continue to keep your eyes closed. You are very relaxed now; very calm, controlled, and relaxed. You will continue to stay calm, in control, and relaxed throughout the entire procedure today. If at any time you wish to communicate with me, you may do so and still

remain relaxed. But right now, just stay relaxed and comfortable, calm, and controlled. If at any time you feel any tension coming into your body, just take a deep breath, and let it drain down and away and continue to breathe deeply and slowly. I want you to stay relaxed, calm, and controlled until we are done."

[Mental Image]:

[Use the patient's favorite place (previously ascertained), mentioning all senses, or read the following:]

"To help you stay relaxed, I'd like you to imagine a very relaxing scene for me; perhaps a lake in a meadow on the edge of a forest, a very calm, beautiful relaxing lake. The water is deep blue. See the sun as it shimmers off the water, like a thousand sparkling diamonds. The sky is a bright blue with puffy white clouds that gently float by. Perhaps the shapes remind you of a face or some animal like a dog or a cat. It really doesn't matter. Just watch the puffy white clouds as they contrast against the blue sky and gently float by. Feel the warmth of the ground beneath you and the warmth of the sun as it shines down on you. Note the contrast of the warmth of the sun and the cool, gentle breeze against your skin. Notice how refreshing the breeze is. Listen to the sounds of rustling leaves and birds singing. The air smells clean and fresh. If you try really hard, you might even be able to smell the faint scent of pine trees in the distance. Just keep your eyes closed and keep thinking about this serene, safe, peaceful, calm, and relaxing scene and how pleasant you feel; how calm you feel; how relaxed and in control you feel. I want you to keep this scene in your mind. If your mind starts to wander, bring it back to this scene. Just enjoy being in this peaceful, serene, safe place in the meadow by the lake."

[End of Relaxation Script]

[Begin dental procedures, or, if practicing the relaxation, go to "Removing Relaxation"]:

It is important to remember the following:

1. If necessary to leave the patient, tell him/her to continue to keep his/her eyes closed, breathe deeply and slowly, continue to think about the relaxing scene, and you will return shortly.
2. Reinforce the relaxation when you return, as well as periodically throughout the dental procedures.
3. Employ any distraction techniques necessary during the anxiety-producing times (e.g., injections, or when taking impressions or radiographs for patients who gag).
4. You and the patient may communicate while the patient is relaxed. If you do, use a soothing, calm voice. If you feel it is necessary, reinforce the relaxation following the interaction.
5. Reinforce the relaxation by simply stating positive suggestions (e.g., "Continue to remain relaxed, calm, controlled, and at ease" or "Take a deep breath through your nose, let it out slowly and continue to relax").

A good distraction technique is breath control. Tell the patient to concentrate on breathing through their nose rather than their mouth and to breathe according to your instructions. Then instruct the patient to hold his/her breath while initiating the dental procedure, for example, entering the gingiva during an injection. Then tell the patient to breathe in a variety of patterns such as letting air out one-half at a time, then one-third at a time, and so on. Just remember to have the patient to breathe normally between breath patterns. An example would be, "Take a deep breath, hold it, now let only half your breath out. Stop, hold it, now let out the other half. Now take a normal breath. Now I'd like you to take another deep breath and only let out one-third of your breath and then hold it. Now let out the next third. Hold it. Now the last third. Now take a normal breath." This can be continued as necessary, for example, one-fourth at a time, one-fifth at a time, and so on, until the injection, impression, and so on, is over.

Giving patients who have gagging problems the suggestion that they can't gag and hold their breath at the same time works very well. Have the patients first take a deep breath, hold their

breath during the placement of the film or impression tray, then let their breath out slowly through their nose, and then breathe slowly through their nose. Whenever they begin to gag, tell them very clearly to “HOLD YOUR BREATH” until the gag passes. Continue to suggest, “YOU ARE IN CONTROL” and repeat the suggestion often. In all situations, give positive reinforcement (e.g., “You’re doing fine”) often. Note that having the first breath that the patient takes after inserting an impression tray be an exhale rather than inhale is less like to trigger a gag reflex.

[Removing Relaxation]:

After you have finished your dental procedures, if it is necessary to arouse the patient, you may do so with the following:

“In a moment I am going to count backwards from 5 to 1. As I count, you will feel all the energy returning to your body. You will feel the energy returning so that when I get to one, you will be wide awake, fully alert, full of energy but very relaxed and calm. You will feel very comfortable, very relaxed, but be fully alert and wide awake. You will feel very refreshed, as if you’ve taken a brief nap. All right, as I count

feel the energy returning . . . 5 . . . feel the energy returning . . . 4 . . . energy flowing back into our body . . . 3 . . . energy returning . . . 2 . . . waking up . . . 1—WIDE AWAKE, FULLY ALERT. Any remaining drowsiness will quickly pass.”

[Conclusion]:

At this time sit the patient upright and converse with the patient for a couple of minutes, making sure he/she is wide awake and fully alert. If the patient should still be a little groggy, just allow the patient some time to become alert. Ask your patients about their perceptions of the procedure and how helpful they found the procedure. Make note of any changes or suggestions for the next time. Remind your patients to practice the relaxation procedure at least once a day, perhaps before going to sleep at night.

On the second visit, find out how successful the patient has been in practicing on his/her own. Reinforce the procedure by readministering the relaxation. After this, patients should be able to perform the relaxation procedures themselves as necessary, with brief suggestions from you. Eventually, they will become desensitized to the dental procedures and will no longer be apprehensive.

Index

Note: Page numbers in *italics* indicate figures; tables are noted with *t*.

- Abscesses, OHRQoL studies of disadvantaged patients with, 21
- Absorption, work engagement and, 366
- Academic environment, culturally balanced, need for, 8
- Academic stress, neglect of oral hygiene and, 31
- Acceptance, empathy and, 245
- Acceptance and Commitment Therapy, 99
- Acceptance-based models, 99–100
- Access to dental care, oral physician and, 375–376
- Acetone breath, hyperglycemia and, 331
- Acinar cells, saliva and, 38
- Acrophobia, 175
- ACT. *See* Acceptance and Commitment Therapy
- ACTH. *See* Adrenocorticotrophic hormone
- Action plan, for periodontitis patients, 243–244
- Active distractions, reducing child disruptive behavior with, 216
- Active listening, 268, 276–277
- Activities of daily living
 - elderly population and, 294, 302
 - oral risk assessment and, 307
 - preventive plan for elders and, 311
- Actual control, dental pain management and, 96
- Acupressure, reducing dental fear with, 142
- Acute necrotizing ulcerative gingivitis, 374
- Acute stress, defined, 29
- Addiction counseling, 234, 379
- ADEA. *See* American Dental Education Association
- Adherence
 - defined, 328
 - preventive practices in elderly and, 312
- Adjunctive behaviors, awake bruxism and, 156
- ADL. *See* Activities of daily living
- Adolescents
 - diabetic, metabolic control and, 332
 - self-efficacy and improved oral health behavior in, 242
- Adrenalin, stress and secretion of, 228
- Adrenocorticotrophic hormone, 30, 40, 228
- Adults, sleep bruxism in, 154
- AED. *See* Awareness enhancement device
- Affective-motivational component, of pain, 100
- African American elderly population, 303
- African cultures, stoicism and, 375

Age

- bias in healthcare and, 373
- dental pain and, 101
- disruptive behavior in children and, 211
- oral health literacy assessment and, 339
- temporomandibular disorders and, 122

Aging

- biological, physiological, and systemic determinants of, 295–300
- dental caries, 298
- edentulism, 300–301
- neuroendocrine response, 296–297
- oral cancer, 301
- oral diseases, 297–298
- periodontal diseases, 298–300
- systemic disease, 297
- environmental and psychosocial factors of, 301–313
 - behavioral intervention, 308–310, 309*t*
 - caregiver/family intervention, 313
 - cognitive behavioral therapy, 310
 - common behavioral oral-systemic disease risk factors, 305
 - cultural aspect of health, 304
 - developing prevention-focused oral health plan, 310–312
 - environmental determinants, 301–302
 - individual's self-perception, 303
 - modern technological advancements, 312–313
 - oral risk assessment, 305–308, 306*t*
 - oral-systemic risk assessment and intervention strategies, 305
 - race and gender, 303–304
 - social, 302–303
- inflammation and, 296
- oral risk assessment and, 305–308
- salivary gland function and, 41
- successful, factors related to, 295

Aging in place, trends in, 303

Aging process, complex web of life events in, 295–296

Alaska Native Tribal Health Consortium, 377

Alcohol consumption

- in elderly, assessing, 311
- heavy, sleep bruxism and, 154
- lifestyle counseling and, 380

oral cancer and, 301

oral ecosystem and, 298

oral risk assessment and, 307

oral-systemic disease risk factors in elderly and, 305

periodontitis and, 228

salivary levels and, 45

stress, periodontitis and, 232, 233

Alcohol Use Disorders Identification Test, 133

Aldosterone, saliva and, 45

Allostatic load, aging and, 296

Alpha-amylase, salivary, 31, 39

Alveolar bone loss

diabetes mellitus and, 324

periodontal disease and, 300

Alzheimer's disease, 297

physical inactivity and, 305

salivary gland hypofunction and, 41

American Academy of Orofacial Pain, 90

American Academy of Pediatric Dentistry, 212

American Dental Education Association, 4

American Medical Association, 76

American Society for Clinical Hypnosis, 147

American Society of Anesthesiology, 331

American Society of Clinical Hypnosis, 83

Amitriptyline, sleep bruxism and use of, 159

Anesthesia, communicating with patient about, 144

Anesthetic delivery system, computerized, 213

Angular cheilitis, 312

"Animal magnetism," 76

Anorexia, dentists as oral physicians and, 382

Antecedent interventions for thumb sucking, 199–200

response covariation, 200

response prevention, 199

Anterior cingulate, pain processing and, 100

Antibiotic revolution, 269

Antibiotics, diabetic patient and, 331, 332

Anticholinergics, xerogenic potential with, 40

Anticipatory guidance sessions, 339

Anticonvulsant mood stabilizers, 382

Antimicrobial rinses, 312

Antipsychotics, first- and second-generation, 382

- Antiseptic rinses, 312
- ANUG. *See* Acute necrotizing ulcerative gingivitis
- Anxiety, 5, 382. *See also* Dental care-related anxiety
- awake bruxism and, 157
 - children with special needs and, 220
 - chronic orofacial pain and, 132
 - chronic pain and screening assessment for, 131
 - cognitive behavioral therapy and, 310
 - dental experience for children and, 211
 - dental pain and, 94, 96–97, 100
 - dentists and, 358
 - four A's of, 144
 - nicotine dependence and, 31
 - periodontitis and, 28
 - sleep bruxism and, 154, 156
 - somatic, 147, 148
- Anxiety-producing terms or phrases, 144
- Anxiety sensitivity, 98–99
- Apolipoprotein (APOE), edentulous elderly and levels of, 297
- Appearance. *See* Physical appearance
- Appraisal, in biopsychosocial model for pain, 126, 127
- Arachnophobia, 175
- ASA. *See* American Society of Anesthesiology
- Asia, growth of elderly population in, 294
- Asian Americans
- elderly population among, 303
 - stoicism and, 375
- Asian populations, oral cancer in, 5
- Aspiration pneumonia, 305
- edentulism and, 300
 - periodontal disease and, 307
- Assessment
- behavioral approach to health care and, 50
 - of dental care-related fear and anxiety, 176–180, 187
 - of drooling behaviors, 256–257
 - of oral health-related quality of life, 14–15, 16*t*, 17, 17*t*
 - sEMG in, 67–70
 - of tongue protrusion, 261
- Assisted-living facilities, oral healthcare and residents in, 302
- Association for Applied Psychophysiology and Biofeedback, web site, 52
- Atherosclerosis, 297
- Attention deficit hyperactivity, recognizing signs/symptoms of, 382
- Attribution theory, diabetes, health behavior and, 330
- Attrition of teeth, sleep bruxism and, 158
- Atypical odontalgias, 91, 124
- Audio recordings
- dental fear reduced with, 147
 - for relaxation training, 53
- AUDIT-C. *See* Alcohol Use Disorders Identification Test
- Auditory prompting, for treatment of tongue protrusion, 260
- Australia, dental care-related anxiety/fear in, 175
- Authoritarian style of hypnosis, 81–82
- Autism Speaks, 220
- Autism spectrum, dental services for individuals on, 220
- Autism spectrum disorders, 219, 380
- Autogenic phrasing, relaxation training and, 53
- Automatic positive reinforcement, thumb sucking and, 197, 198
- Autonomic nervous system, salivary gland secretion and, 38
- AVDR model, 134
- Aversive taste treatment, thumb sucking and, 201
- Avoidance
- coping with stress and, 229
 - dental care-related fear/anxiety and, 169–170, 176
- Awake bruxism, 160
- assessing, 158, 160
 - characteristics of, 153
 - prevalence of, 154
 - treatment for, 159–160
- Awareness enhancement device, for thumb sucking, 199, 201–202, 203
- Baby boomers, aging of, 294
- Back pain, 130
- Bandpass, sEMG system and, 66, 67

- Bandura's self-efficacy theory, 238
BBMD. *See* Bruxcore bruxism-monitoring device
BDD. *See* Body dysmorphic disorder
Behavior, in biopsychosocial model for pain, 126, 127
Behavior modification
 biofeedback and, 50
 reducing dental fear with, 142
Behavior support, people with special needs and, 342
Behavioral assessment
 of dental care-related fear and anxiety, 179
 of thumb sucking, 196–197
Behavioral interventions, 313
 for dental care-related anxiety/fear, 181–184, 186
 for elderly population, 308–310, 309*t*
Behavioral obstacles, overcoming, for people with special needs, 338, 342–343
Behavioral scientists, oral health-related quality of life and, 22
Behavioral screening, 382–383
Behavioral studies, of drooling, 257
BF/SM. *See* Biofeedback/stress management
Bias, dental academic workforce and, 6
Bicarbonate buffer system, saliva and, 39
Bio-psycho-social-dental approach, 7, 13, 17
Biobehavioral assessment data, TMD management and, 134–136
Biofeedback, 146
 chronic pain conditions and, 135
 dental care-related anxiety/fear and, 142, 148, 148*t*, 181, 183
 for TMD patients, 56
 training, 54, 70–71
Biofeedback-assisted relaxation
 for awake bruxism, 159, 160
 training in, muscles selected for, 64–65
Biofeedback systems, computerized, 54
Biological factors, dental care-related anxiety/fear and, 171
Biomaterials, 17
Biomimetics, 17
Biopsychosocial model
 of health, 13
 for pain, 123, 125–127, 129
 appraisal, 126, 127
 behavior, 126, 127
 chronic orofacial pain and, 124–125
 dentistry and, 134
 five-stage process in, 126
 integrative nature of, 128
 nociception, 126, 126
 perception, 126, 127
 sick role, 127
Biotene, 312
Bipolar disorder
 dentists and screening for, 379
 recognizing signs/symptoms of, 382
Bite guards
 accommodating, biofeedback-assisted muscle training for, 52
 evaluating reaction of muscular system to, 68
Blood-brain barrier, stress and, 297
Blood glucose level, diabetic patients and, 331, 332
Blood glucose monitors, 312
Blood-Injection-Injury (BII) Phobia, 167
Blood pressure
 dental care-related fear/anxiety and, 179
 sensors, 312
Blunting, dental pain and, 95
Board of Registration in Dentistry, 379
Board of Registration in Medicine, 379
Body dysmorphic disorder, 110, 112–113, 117
 characteristics among Dutch general population *vs.* people receiving treatment at cosmetic dental clinic, 114, 114
 in dental practice, 113–114
 DSM-IV-R criteria for, 112, 113
 guidelines for working with patients, 116–117
 prevalence of, 112
 psychological assessment of patients with, 115, 116*t*
 recognizing signs/symptoms of, 382
 social functioning in people with, 113
 as state of mind?, 114–115
 treatment plans for, 117
Body movement, physical listening and, 277
Body parts, dissatisfaction with, 110*t*

- Bone loss
 ligature-induced periodontitis and, 28
 stress and, 30
 “Booster sessions,” for reducing drooling, 258, 259
- Borderline personality disorder, recognizing signs/symptoms of, 382
- Botox (botulinum toxin Type A), 110
- Bottle use, knowledge about, 241
- Botto Brief Relaxation, dental fear reduced with, 148
- Botulinum toxin, sleep bruxism and use of, 159
- Braid, James, 76
- Brain
 aging and, 296
 pain processing in, 100
- Brain-imaging modalities, 124
- Breaks, scheduled, reducing child disruptive behavior with, 217, 218*t*, 219, 221*t*
- Breast augmentation, 110
- Breast cancer, salivary biomarkers for, 45
- Breath control, 145, 394
- Breathing
 relaxation training and, 53
 slow-paced diaphragmatic, instruction in, 70–71
- Brief Relaxation Procedure, 147, 148–149
- Bromocriptine, sleep bruxism and, 159
- Bruxcore bruxism-monitoring device, 157–158
- Bruxism, 127, 130, 374. *See also* Awake bruxism; Sleep bruxism
 biofeedback training and, 51
 defined, 154
 effects of, 154–155, 155
 etiological theories of, 155–157
 sEMG in treatment of, 52
 social costs of, 155
 stress and, 154
 treatment for, 158–160
- Buffer systems, in saliva, 39
- Bulimia nervosa
 dentists and referrals for, 376
 dentists as oral physicians and, 382
 salivary function and, 40
- Burning mouth syndrome, 101, 132, 374
- Burnout, 358
 defined, 365
 health complaints and, 366, 368
 Job Demands-Resources model and, 365, 365
 person-environment fit and, 369–370
 preventing, 370–371
 process of, 365–366
- C-reactive protein (CRP), 305
 aging process and levels of, 296, 299
 stress and, 31
- Caffeine intake
 saliva and, 45
 sleep bruxism and, 154
- CAL. *See* Clinical attachment loss
- Calcium hydroxyapatite, saliva and, 39
- CAMBRA. *See* Caries Management by Risk Assessment
- Cambridge Health Alliance (Massachusetts), 378
- Cancer, 378
- Candid Camera, 351
- Candida albicans*
 salivary gland hypofunction and, 42
 salivary levels of, 45
- Carbohydrate monitoring, diabetic patients and, 328
- Cardiovascular disease
 aging and, 297
 dentists and referrals for, 376
 dentists and screening for, 378
 diet, ethnic diversity and, 6
 early diagnosis and treatment for, 381
 periodontal disease and, 307
 physical inactivity and, 305
 smoking and, 31
 stress and, 31
 untreated oral disease and, 176
- Cardiovascular (thermal) training, 70
- Career perspective, lack of, burnout in dentists and, 366, 369
- Caregiver intervention, for ill/disabled older adults, 313
- Caribbean region, growth of elderly population in, 294
- Caries development, factors involved in, 299

- Caries Management by Risk Assessment, 340
- Caries removal, chemomechanical *vs.* traditional, quality of life and, 18
- Cartoons, dental humor and, 359, 360
- Case scenarios, 289
- Catastrophizing
dental care-related anxiety/fear and, 171, 184
dental pain and, 98, 100–102
- Catecholamines
stress and secretion of, 29, 30, 228
urinary, sleep bruxism and levels of, 156
- CBST. *See* Cognitive behavioral skills training
- CBT. *See* Cognitive-behavioral therapy
- CDR. *See* Continuous duration recording
- Cellular immune response, stress and, 30
- Centers for Disease Control, on HIV screening, 381
- Central nervous system, pain and, 123
- Cerebral palsy
drooling in patients with, 252
electronic cueing and drooling in children with, 254
- Cervical paraspinal muscles, sEMG in
assessment of, 69
- Cetylpyridinium chloride mouth rinse, 312
- Cevimeline hydrochloride, 45
- “Chairsides” strategies, for managing dental care-related fear/anxiety, 180–181
- Characteristic Pain Intensity, 130
- Cheek-jiggling, 145
- Cheekbiting, 374
- Chemotherapy, salivary changes and, 41
- Child-friendly terms, for dental tools, 214, 215*t*
- Child-onset dental care-related anxiety/fear, family history of dental-care related distress and, 174
- Child Oral Health Impact Profile, 15
- Child Perception Questionnaire_{8–10}, 15
- Child Perception Questionnaire_{11–14}, 15
- Children. *See also* Pediatric dentistry
dental fear and anxiety in, 166
development of humor in, 351–352, 354–355
diabetes and periodontitis in, 325
diabetic, metabolic control and, 332
motivational interviewing and decreased caries in, 245
oral health-related quality of life for, assessing, 15
self-efficacy in, role of family and, 241
sleep bruxism in, 154
vicarious dental care-related anxiety and fear in, 171
- Children with special needs, 219–221
desensitization and, 220
developmental and verbal level in, 220
drooling in, 252
gag reflex and differences in, 220
guides available for, 220–221
oral health and, 210
preparation for dental appointment and, 220
- Children’s disruptive behavior during dental treatment, 209–222
factors related to, 212
overview, 210
positive approaches to behavior management, 212–217, 218*t*, 219, 221, 221*t*
distraction, 215–216, 218*t*, 221*f*
effective communication, 214–215, 218*t*, 221*t*
modeling, 214, 218*t*, 221*t*
parent presence in operator, 213–214, 218*t*, 221*t*
reduction of discomfort, 213, 218*t*
reinforcement for good behavior, 216–217, 218*t*
scheduled breaks, 217, 218*t*, 219, 221*t*
reasons for, 210–212
- China, growth of elderly population in, 294
- Chlorhexidine gluconate, 312
- Choice-based distraction, reducing child disruptive behavior with, 216, 221*t*
- Christian Science, hypnosis prohibited by, 77
- Chromogranin A, stress and salivary levels of, 31, 156
- Chronic health conditions, noncommunicable lifestyle-related, 294, 294*t*
- Chronic orofacial pain, 121–136
assessing psychological and psychosocial factors in, 129–130

- biopsychosocial model for, 124–125
 - dentist as biobehavioral clinician, 134–136
 - dual-axis approach to assessment of dental pain and, 128–129
 - Multidimensional Pain Inventory, 132–133
 - overview of, 122–124
 - pain and treatment history, 130–131
 - parafunctional jaw behaviors, 131
 - physical and psychosocial status, 132
 - physical and sexual abuse and, 134
 - posttraumatic stress disorder and, 134
 - psychological status and, 131–132
 - sleep disturbance and, 133
 - substance abuse and, 133
 - temporomandibular joint disorders and, 122–123
- Chronic pain behavior, Fordyce's seminal concepts on, 127
- Classical conditioning, dental fear/anxiety and, 169
- Cleft palate, 374
- Clenching behaviors, 154, 374
- Clinical attachment loss, periodontitis patients and, 230, 232
- Clinical practice, oral health-related quality of life and, 19–20
- Clinician Administered PTSD Scale, 134
- Clonidine, sleep bruxism and use of, 159
- Closed-ended questions, 276
- "Club Sandwich" positive-negative-positive technique, SPs, feedback and, 288
- Cluster analytic techniques, dental care-related anxiety/fear and, 175
- Cocaine, salivary levels and, 45
- Cognitive abilities, children with special needs and, 220
- Cognitive anxiety, 148
- Cognitive behavior modification, reducing dental fear with, 142
- Cognitive behavioral approach, for periodontal self-care, 243
- Cognitive behavioral skills training, in managing TMD-related pain, 55
- Cognitive-behavioral therapy
 - for awake bruxism, 159, 160
 - biobehavioral pain management modalities and, 135
 - for body dysmorphic disorder, 117
 - elderly and, 310
 - sleep disturbance and, 133
- Cognitive-evaluative component, of pain, 100
- Cognitive factors, dental care-related anxiety/fear and, 171–172
- Cognitive function, aging and, 297
- Cognitive interventions, for dental care-related anxiety/fear, 146, 184, 186
- Cognitive restructuring, dental fear reduced with, 148
- COHIP. *See* Child Oral Health Impact Profile
- Cold pressor test, 92
- Collagen network, aging and, 296
- Collegial contacts, burnout prevention and, 371
- Color-naming tests, 180
- Comic relief, in dentistry, 358–359, 359, 360
- Communicable diseases, migrant populations and, 5
- Communication. *See also* Interpersonal communication
 - children and direct path of, 356
 - in doctor-patient relationship, 269–270
 - effective, reducing child disruptive behavior and, 214–215, 218*t*, 221*t*
 - litigation and, 270
 - oral healthcare providers, dental pain and, 93–94
 - patient adherence patterns and, 270
 - people with special needs and, 343
 - reducing dental fear with, 143–145
 - relationship between equals and, 8
 - understanding patients and, 284
- Comorbidities, oral risk assessment and, 307
- Compliance, defined, 328
- Computer-based sEMG systems, 65–66
- Computer resources, for interpersonal communication training, 285
- Computerized local anesthetic delivery system, 213
- Conceptual incongruity, humor in children and, 354
- Concrete operations, in Piaget's cognitive stages of child development, 353*t*
- Conditioned response, 97
- Conditioned stimuli, 97, 169

- Consequent interventions for thumb sucking, 200–201
 aversive taste treatment, 201–202
 response cost, 201
- Contingent auditory stimulation, thumb sucking and, 201–202
- Contingent escape approach, reducing child disruptive behavior with, 219
- Continuous duration recording, of thumb sucking, 196
- Control issues
 dental care-related anxiety/fear and, 172
 dental pain management and, 96
- Cooperative behaviors, learning, disruptive children and, 219
- Coping, defined, 228
- Coping styles, dental pain and, 95
- Corah, Norman, 269
- Coronary artery disease, periodontitis and, 380
- Corticotrophin-releasing hormone, 228
- Cortisol, 45
 salivary, increase and decrease in levels of, 39
 stress and levels of, 30
- Cosmetic interventions, 117
 “addiction” to, maintenance of, 112, 112*t*
 increasing popularity of, 110–111
 quality of life and, study of, 111–112
- CP. *See* Cerebral palsy
- CPQ. *See* Child Perception Questionnaire
- CR. *See* Conditioned response
- Craniomandibular syndrome, postural dysfunction and, 68
- CRH. *See* Corticotrophin-releasing hormone
- Cross-cultural studies, on family and self-efficacy in children, 241
- Crushed idealist, profile of, 368
- CS. *See* Conditioned stimuli
- Cueing techniques for drooling, 253–254
 guidelines for clinical use of, 257–258
- Cultural beliefs, oral health literacy assessment and, 339
- Cultural differences, listening skills and, 272
- Culturally competent staff, need for, 7–8
- Culture
 definitions of, 4
 dental pain and, 101
 health and, 304
 incorporating into dentistry, 4
 patient management and impact of, 4–6
- Cup style electrodes, 59, 60, 62
- Curby cup, unstimulated saliva and, 42
- Cures, complexity of, 128
- Cytokine network, stress and, 30, 32
- D-cycloserine, 185
- Daily mouth care
 discussing, people with special needs and, 339
 partial participation techniques and, 340–341, 341, 342
- Daily Mouth Care Plan, 345–346, 347
- DAQ. *See* Dental Anxiety Question
- DAS. *See* Dental Anxiety Scale
- DAT. *See* Dental Admissions Test
- Davey’s model, 97–98
- Daydreaming, as barrier to effective listening, 273
- Daytime clenching, defined, 154
- DC/TMD. *See* Diagnostic Criteria for Temporomandibular Disorders
- DCBS. *See* Dental Coping Belief Scale
- DCQ. *See* Dental Cognitions Questionnaire
- DDS degree, 376
- Deafness, cueing techniques and, 254
- Decayed teeth, avoidance of treatment and, 176
- Dedication, work engagement and, 366
- Deep bite, sleep bruxism and, 156
- Deep breathing
 dental fear reduced with, 148
 relaxation procedure in dental office and, 391
- Defensive coping style, 230
 clinical attachment loss and, 231
 periodontal therapy, correlations between reduced number of slight and moderate sites and increased number of severe sites and, 232*f*
- Demands and resources, work stress and, 364, 365
- Dementia, 297
- Denmark, dental care-related anxiety/fear in, 175

- Dental academic workforce, culturally diverse, need for, 6–8
- Dental Admissions Test, 271
- Dental anxiety, 165
 biofeedback-assisted relaxation/desensitization training for, 52
 communication and, 269
 conceptual considerations with, 166–168
 relaxation training and, 70
- Dental Anxiety Question, 178
- Dental Anxiety Scale (Corah), 143, 177
- Dental appliances
 accommodating, biofeedback-assisted muscle training for, 52
 evaluating reaction of muscular system to, 68
- Dental appointments
 diabetic patients and, 326–327
 diabetics' nonattendance at, reasons for, 329
- Dental care
 avoidance of, dental fear and, 142
 effective interpersonal communication and, 284–285
- Dental care-related anxiety, 166
 assessment of
 behavioral assessment, 179
 Dental Fear Interview, 180
 overview, 176–177
 physiological assessment, 179–180
 verbal report assessment, 177–179
 classification of patients with, 174–175
 dental care-related fear *vs.*, 167–168
 epidemiological considerations in, 175–176
 etiology of, 168–173
 biological influences, 171
 cognitive factors, 171–172
 conditioning, 169–170
 pain-related factors, 173
 personality, 172–173
 social learning, 170–171
 impact on treatment-seeking patterns, and relation to associated variables, 174
 interventions for, 180–186
 behavioral interventions, 181–184, 186
 cognitive interventions, 184, 186
 pharmacological and integrative, 185–186
 psychoeducation, 184–185, 186
 model of continua of dental care-related anxiety and, across general population, 168, 168
 recovery from, 175
 resources on, 181
 summary remarks on, 186–187
- Dental care-related fear, 166. *See also* Dental fear; Dental fear, reducing
 assessment of, 176–180
 behavioral assessment, 179
 Dental Fear Interview, 180
 overview, 176–177
 physiological assessment, 179–180
 verbal report assessment, 177–179
 classification of patients with, 174–175
 dental care-related anxiety *vs.*, 167–168
 epidemiological considerations in, 175–176
 etiology of, 168–173
 biological influences, 171
 cognitive factors, 171–172
 conditioning, 169–170
 pain-related factors, 173
 personality, 172–173
 social learning, 170–171
 impact on treatment-seeking patterns, and relation to associated variables, 174
 interventions for, 180–186
 behavioral interventions, 181–184, 186
 cognitive interventions, 184, 186
 pharmacological and integrative, 185–186
 psychoeducation, 184–185, 186
 model of continua of dental care-related anxiety and, across general population, 168, 168
 recovery from, 175
 resources on, 181
 summary remarks on, 186–187
- Dental caries
 aging and, 298
 diabetes mellitus and, 325
 reducing, antiseptic and antimicrobial rinses for, 312
 salivary gland hypofunction and, 43
- Dental chairs, dental pain and, 93
- Dental cleaning
 diabetic patients and, 326, 328
 elderly patients and, 312

- Dental Cognitions Questionnaire, 179
 - Dental consultation, self-efficacy subscales for, 241
 - Dental Coping Belief Scale, 242
 - Dental/dental hygiene education, oral health-related quality of life and, 20
 - Dental education, 3–9
 - culturally balanced academic environment, 8
 - culturally diverse teaching staff and dental training courses, 6–8
 - culture and impact on patient management, 4–6
 - culture incorporated into dentistry, 4
 - future challenges in, 8–9
 - interpersonal communication training in, 285
 - factors influencing design of, 285–286
 - SP as tool in medical and, history behind, 286–287
 - Dental fear, 165
 - conceptual considerations with, 166–168
 - prevalence of, 142, 166
 - Dental fear, reducing, 141–150
 - good communication and, 284
 - non-relaxation-based techniques, 143–146
 - communication, 143–145
 - distraction, 145–146
 - quasi-relaxation-based techniques, 146
 - guided imagery, 146
 - relaxation-based techniques, 146–149
 - Dental Fear Interview, 180
 - Dental Fear Survey, 178
 - Dental Health Knowledge Questionnaire, 242
 - Dental humor, cartoons, 359, 360
 - Dental hygienists, 376
 - Dental insurance, employer-based, retirement and, 302
 - Dental pain
 - biological perspective for, 90–91
 - cognitive determinants of, 100–101
 - dual-axis approach to assessment of, 128–129, 129
 - emotional determinants of, 96–100
 - acceptance-based models, 99–100
 - Davey's model, 97–98
 - expectancy model of fear, 98–99
 - fear-avoidance model, 98
 - Mowrer's two-factor theory, 97
 - overview, 96–97
 - environmental determinants of, 92–96
 - controllability, 96
 - dental personnel, 93
 - distraction, 94
 - overview of, 92–93
 - predictability, 94–96
 - relationships with oral healthcare providers, 93–94
 - gender, culture, lifespan issues and, 101–102
 - individual differences in, 101
 - socioeconomically disadvantaged students and, 21
 - understanding, conceptual issues in, 91–92
- Dental personnel, dental pain and encounters with, 93
- Dental phobias, 186
 - epidemiological considerations in, 175
 - hypnosis and, 83
 - interventions for, 180–186
 - pain and, 91
 - traumatic conditioning and, 170
- Dental practice
 - job resources in, 369*t*
 - work demands in, 368*t*
- Dental schools
 - burnout prevention and, 371
 - stressors in, 357–358
- Dental self-efficacy. *See also* Self-efficacy
 - dentist and improving/shaping perception of, 247
 - sources of, in oral health behavior, 240–241
- Dental students, stress and, 370
- Dental terminology
 - child-friendly, 214, 215*t*
 - child patients, humor and, 357, 358*t*
 - dental phobics and choice of, 180
- Dental training courses, culturally diverse, need for, 6–8
- Dental treatment
 - avoidance of, consequences related to, 176
 - body dysmorphic disorder in relation to, 113–114

- Dental visits, dental self-efficacy and, 239
- Dentin Hypersensitivity-Related Quality of Life Scale, 14–15
- Dentistry
communication skills and, 269
demanding work aspects in, 366, 367
incorporating culture into, 4
- Dentists. *See also* Oral physicians
as biobehavioral clinicians, 134–136
burnout profiles of, 366, 367, 368
dental self-efficacy and, 247
effective interpersonal communication with, 284–285
Job Demands-Resources model among, 369
job resources and, 368–369, 369*t*
parents in operatory and distractions for, 214
- Denture patients, quality of life research on, 18–19
- Denture stomatitis, 300, 312
- Dentures
caring for, 312
OHRQoL and, 18
- Depressed dentist, profile of, 368
- Depression, 135
chronic orofacial pain and, 132
chronic pain and, 122, 123
screening assessment for, 131
cognitive behavioral therapy and, 310
DC/TMD and, 129
dental pain and, 96
dentists and, 358
lifestyle change in elderly and, 310
myalgia and, 124
neglect of oral hygiene and, 31
nicotine dependence and, 31
periodontitis and, 28, 228, 380
recognizing signs/symptoms of, 382
salivary function and, 40, 41
stress-related, 30
- Derailing, as barrier to effective listening, 272–273
- Desensitization, children with special needs and, 220
- DFS. *See* Dental Fear Survey
- DHS-QoL. *See* Dentin Hypersensitivity-Related Quality of Life Scale
- Diabetes, 305
diet, ethnic diversity and, 6
periodontal disease and, 307
physical activity, self-efficacy and, 239
salivary biomarkers for, 45
salivary gland hypofunction and, 41
type 2
edentulism and, 300
prevalence of, 324
in southeast Asians, 6
untreated oral disease and, 176
- Diabetes care clinics, 328
- Diabetes Control and Complications Trial Research Group, 327
- Diabetes mellitus, 323–332, 378
dentists and screening for, 378
early diagnosis and treatment for, 381
health behavior and, 326–330
diabetes health behavior, 327–329
health behavior models, 329–330
oral health behavior, 326–327
health complications with, 327
knowledge of, and effective elimination of oral infections, 332
oral diseases and, 324–326
periodontal disease and, bidirectional relationship between, 323, 325, 332
periodontitis and, 228
prevalence of, 324
prevention and early diagnosis of oral diseases, 332
- Diabetes self-efficacy, dental self-efficacy and, 239
- Diabetes self-management education, recommendations for, 329
- Diabetic coma, 331
- Diabetics as dental patients, 330–332
collaboration with other healthcare professionals and, 332
emergency situations and, 331
oral health behaviors among, *vs.* among nondiabetic controls, 326–327, 327*t*
self-care practices for, 328, 329
special features in treatment of, 331–332

- Diagnoses, ethnocultural differences in pain perception and, 375
- Diagnostic and Statistical Manual of Mental Disorders-Fifth Edition (DSM-5), dental phobia and blood-injection-injury code, 167, 180
- Diagnostic Criteria for Temporomandibular Disorders, 123, 128, 130*t*, 136
- Diaphragmatic breathing, 145
for dental care-related anxiety/fear, 182
relaxation procedure in dental office and, 391
slow-paced, 70–71
- Diaries, oral self-care, 243
- Diet. *See also* Nutrition
cultural and ethnic diversity and, 6
diabetic patient and, 331
edentulism and, 300
oral cancer and deficits in, 301
oral ecosystem and, 298
oral risk assessment and, 307
oral-systemic disease risk factors in elderly and, 305
restricted, elderly and, 310
self-efficacy and, 239, 241
- Differential reinforcement of other (nonchallenging) behavior, 253
- Difficult patient contacts, burnout in dentists and, 366, 369
- Digastric muscles, sEMG techniques and study of, 62
- Digital deformities, thumb sucking and, 196
- Disadvantaged children, hunger and toothache pain in, 21
- Discomfort
oral health-related quality of life and, 12
reduction of, disruptive children in dental clinic and, 213
- Discrepancy, developing, motivational interviewing in dentistry and, 245–246
- Disgusted dentist, profile of, 368
- Disparities
in dental care access, 375
in health, socioeconomic environmental inequalities and, 302
in health literacy, ethnoculturally diverse patients and, 375
- Disruptive child behavior. *See* Children's disruptive behavior during dental treatment
- Distractions
breath control, 394
dental fear reduced with, 142, 143, 145–146, 148
dental pain and, 94
for disruptive children, 215, 218*t*, 221
- Distractive coping, 229, 230
- Distress, 364
- Diversity, of dental student population, 6–7
- DMD degree, 376
- DNA methylation patterns, intrauterine, 296
- Doctor-patient relationship, communication in, 269–270
- Doctors Talking with Patients; Patients Talking with Doctors* (Roter and Hall), 269
- Dolls, thumb sucking and, 200
- Domestic violence, 382
chronic TMD pain and, 134, 136
dentists and inquiries about/referrals for, 376, 378
screening for, 379
- Down syndrome, tongue protrusion in children with, 259–260, 261
- Dribble box, 254, 257, 258
- DRO. *See* Differential reinforcement of other (nonchallenging) behavior
- Drooling
critical examination of experimental methodology, 256–257
definition, prevalence, and cause, 252, 256
guidelines for clinical use of behavioral treatment procedures, 257–259
self-management and, 256
summary of treatment strategies for, 261
treatment procedures for, 252–256
cueing techniques, 253–254
instruction, prompting, and positive social reinforcement, 252–253
microswitch-based techniques, 254–256
negative social reinforcement and, 253
- Drug addiction
dentists and recognition of, 379
sleep bruxism and, 158

- Drug use, stress, periodontitis and, 232, 233
- Dry mouth (xerostomia), 307–308, 311, 312, 324, 332, 338, 374
 chronic conditions associated with, 40*t*
 signs and symptoms of, 41–42, 42*t*
 stress and, 40
- DSME. *See* Diabetes self-management education
- Dual-axis approach, to assessment of dental and orofacial pain, 128–129, 129*t*
- Ductal cells, saliva and, 38
- Dysphagia, 62
- Dystonias, sleep bruxism and, 158
- Ear complaints, among dentists, 368
- Eating disorders
 dentists and referrals for, 376
 dentists as oral physicians and, 382
 screening for, 379
- Edentulism
 aging and, 297, 300–301, 312
 diabetes mellitus and, 324
- Educational level, elderly population, race, gender and, 303
- EEG activity, sleep bruxism and increase in, 156
- EEG gel, 60
- EEG paste, avoiding, 60
- Efficacy expectation, 238
- Elderly population. *See also* Aging
 out-of-pocket dental costs for, 302
 socioeconomic fabric of society and, 293–294
- Electrical interference, laptops for sEMG use and, 66, 67
- Electrode contacts, flat, placement of, 59
- Electrode gel
 proper use of, 59–60
 sensor attachment and, 62
- Electrode patch, disposable, sensor incorporating preamplifier attached to, 59
- Electrodermal training, 70
- Electrodes
 spacing for, 60
 types of, sEMG sensor systems, 58–60
- Electronic cueing, drooling and, 253–254
- EMG activity
 as measure of muscle activity, 56–57
 quantifying, 65
- EMG recordings
 awake bruxism and, 158
 sleep bruxism and, 157, 157
- EMG sensors and recording techniques
 surface, 57–62
 electrode spacing, 60
 preamplified sensors, 58
 sensor placement, 57–58, 58, 61
 skin preparation, 60–62
 types of electrodes, 58–60
- EMG signal, detecting, 57
- Emotional arousal, self-efficacy and, 238
- Empathy
 good listening and, 275
 motivational interviewing and, 245, 309
- Endodontic therapy
 dental pain management and, 95
 pain with, 90
 social learning and, 171
- Endogenous dental care-related fear, 174
- Engagement
 Job Demands-Resources model and, 365, 365
 positive, 366
- Entrepreneurship, 369
- Epigenetics, 124
- Ergonomics, 368
- Erickson, Carol, 78
- Erickson, Milton, 76, 78
- Escape behaviors
 child disruptive behavior and, 217
 coping with stress and, 229
- Esthetic interventions, increasing popularity of, 110–111
- Esthetic requests, guidelines in working with patients and, 116–117
- Estrogen, saliva and, 45
- Ethnicity. *See* Race/ethnicity
- Europe, growth of elderly population in, 294
- Eustress, 364
- Evoxac, 45

- Exercise
 burnout prevention and, 371
 diabetic patients and, 328
 elderly and, 310
 self-efficacy and, 239
- Exogenous dental care-related anxiety, 174
- Expectancy model of fear, 98–99
- Exposure therapy, for dental care-related anxiety/fear, 181, 182–183
- Extension leads, use of, sEMG sensor system, 59
- Extractions, pain with, 90
- “Extreme Makeover” (television program), 110, 111
- Eye complaints, among dentists, 368
- Eye contact, 304
- Eyelid surgery, 110
- “Face your fears” approach, for dental care-related anxiety/fear, 183
- Facial expression, physical listening and, 277
- Facial-muscle activity, thumb sucking and, 196
- Faculty
 diabetes counseling and, 330
 diversity and backgrounds of, 7
 SPs, quality assurance and development of, 289–290
- Falls, 305
- Family, self-efficacy in children and role of, 241
- Family intervention, for ill/disabled older adults, 313
- Family physicians, dentists seen more frequently than, 378
- FDA. *See* Food and Drug Administration
- Fear, 382. *See also* Dental fear
 children with special needs and, 220
 dental experience for children and, 211
 dental pain and, 94, 95, 96, 97
- Fear-avoidance model, 98, 127
- Fear hierarchy, creating, 183
- Fear of injury model, 127
- Fear of Pain Questionnaire-III, 96, 179
- Feedback, principles for training SPs and, 288
- Feelings
 listening for, 268
 reflection of, 278–279
- Female dental students, increase in, 6
- Female dentists, burnout levels and, 369
- Females, judgment of physical attractiveness and, 374
- Filtering, as barrier to effective listening, 273
- Financial worries
 increased CAL, alveolar bone loss and, 28
 psychosocial stresses, periodontal disease and, 229
- Fine-wire recordings, of muscle activity, 57
- Finger sucking. *See* Thumb-sucking
- Flat silver electrodes, 60
- Floss holders, adaptations with, 340
- Flossing
 dental self-efficacy and, 239
 SCT variables and frequency of, 242
- Fluoridated water, 308
- Fluoride exposure
 in elderly, assessing, 311
 oral risk assessment and, 307
- Fluoride rinses, 311
- Fluoride toothpaste, 311
- Food and Drug Administration, 40
- Foot care examinations, diabetic patients and, 328
- Four A’s of Anxiety, 144
- FPQ-III. *See* Fear of Pain Questionnaire-III
- Franklin, Benjamin, 76
- Frantic runner, profile of, 368
- Frequency range, sEMG signal and, 66
- Freud, Sigmund, 76, 373
- Frontal wide placement, for monitoring grouped muscle activity, 64
- Functional MRI, 124
- Fungal infections, salivary gland hypofunction and, 42
- Gag reflex
 breath control and, 394–395
 children with special needs and, 220
- Galvanic skin response, 70
- Gastroesophageal reflux disease, 307
- GCF. *See* Gingival crevicular fluid
- GCP. *See* Graded Chronic Pain Scale
- Gender
 awake bruxism and, 154
 bias in healthcare and, 373

- dental care for elderly, limitations with ADLs, 302
- dental care-related anxiety/fear and, 175–176
- dental pain and, 101, 102
- dental self-efficacy and, 239
- dissatisfaction with body parts, 110*t*
- elderly healthcare and, 303–304
- judgment of physical attractiveness and, 374
- listening and, 272
- medical appointment length and, 270
- oral health literacy assessment and, 339
- oral risk assessment and, 307
- temporomandibular disorders and, 122
- Gene mapping, saliva function and, 45
- Gene mutations, periodontitis and, 228
- Gene therapy, for salivary gland dysfunction, 45
- General anesthesia, 185, 212
- General Dental Council (UK), 4
- Generalist dental practitioners, cultural diversity and, 8–9
- Generality, efficacy expectations and, 238
- Generalization, people with special needs and, 343
- GERD. *See* Gastroesophageal reflux disease
- Geriatric syndromes, 294
- “Getting-to-know-you” visits, children with special needs and, 220
- Gingival bleeding, diabetes mellitus and, 324
- Gingival crevicular fluid, stress and, 30
- Gingival inflammatory response, in elderly, 298
- Gingival thinning and recession, aging and, 298
- Gloves, for thumb sucking, 199
- Glucometers, 331, 332
- Glucocorticoids, chronic stress and levels of, 29
- Glucose screening, in dental clinics, 381
- Glycemia, periodontal inflammation and, 325
- Glycemic control, assessment of, by diabetic patients, 328
- Goal setting, for interpersonal communication training, 285
- Good behavior, reinforcement of, reducing child disruptive behavior with, 216–217, 218*t*
- Graded Chronic Pain Scale, 132, 133*t*
- Graduated exposure, dental fear reduced with, 142, 148
- Graduates of dental schools, cultural diversity and, 8
- Grinding behaviors, 154, 155, 157, 158
- Grooming, physical listening and, 277
- Group settings, daily mouth care for people with special needs in, 343–344
- GSR. *See* Galvanic skin response
- Guided imagery
- dental fear reduced with, 146, 148, 148
- in relaxation procedure, 390, 392, 394
- Guillotin, Joseph, 76
- Habit reversal training
- for awake bruxism, 159–160
- for thumb sucking, 202
- Hair, sensor attachment and, 62
- Hair pulling, thumb sucking and, 200
- Halitosis, 374
- Hall, Judith, 269, 270, 271
- Hand-over-mouth procedure, 212–213
- Hand-raising, reducing child disruptive behavior with, 217
- Happiness, cosmetic dental interventions and improvement in, 111–112
- Harvard Medical School, 378
- Harvard School of Dental Medicine, 378
- Harvard University, 376
- Head and neck cancer
- human papillomavirus and, 383
- parotid-sparing radiotherapy for, 18
- Head control, drooling and, 252
- Head nods, 276
- Headaches, awake bruxism and, 155
- Headgear, for thumb sucking, 199
- Health
- biopsychosocial model of, 13
- cultural aspect of, 304
- migrant populations and social determinants of, 5
- self-efficacy in, 238–239
- Health behavior, self-efficacy in, 238–239

- Health behavior models, diabetes and, 329–330
- Health Belief Model, self-efficacy and, 240
- Health complaints, burnout and, 366, 368
- Health inequalities, oral health and, 5, 6
- Health promotion messages, people with special needs and, 339
- Health status, self-rated, multidimensional nature and domains of, 303
- Healthcare system
 - aging population and, 294
 - dentists as oral physicians in, 376
- Healthy lifestyle, burnout prevention and, 371
- Healthy mind, in elderly, maintaining, 297
- Hearing
 - deficits in elderly, dental care and, 302–303, 312
 - listening *vs.*, 275
- Heart disease, 305, 378
- Heart rate
 - dental care-related fear/anxiety and, 179
 - sleep bruxism and, 156
- Hepatitis, dentists and screening for, 378
- Hepatitis C
 - screening for, 378
 - xerostomia and, 41
- Herpes labialis, recurrent, 374
- Hierarchy of needs, Maslow's theory of, 374
- High-pass filtering, 66
- Hispanics
 - elderly population among, 303
 - traditional alternative medical models of care and, 304
- HIV. *See* Human immunodeficiency virus
- Holistic approach, to patient care, 13
- Holistic health models, 304
- Hormonal replacement therapy, oral ecosystem and, 298
- HPV. *See* Human papillomavirus
- HPV-16, oropharyngeal cancer and, 301
- Human adaptation, OHRQoL and challenge of, 21
- Human immunodeficiency virus
 - dentists and screening for, 378
 - salivary gland function and, 41
 - screening for, 381–382
- Human papillomavirus
 - head and neck cancers and, 383
 - oropharyngeal cancer and, 301
- Humor
 - in children, development of, 351–352, 354–355
 - definitions related to, 350
 - positive benefits with, 350
 - for children, 355*t*
 - stress of dentistry and, 357–359
 - theories of, 350–351
 - incongruity theory, 350, 351
 - relief theory, 350–351
 - superiority theory, 350, 351
- Humor dictionary, suggested, 358*t*
- Humoral immune response, stress and, 30
- Hydrocortisone, stress and levels of, 30
- Hygiene, oral-systemic disease risk factors in elderly and, 305
- Hyoid muscles, sEMG techniques and study of, 62
- Hyperglycemia
 - aging and, 297
 - periodontal disease and, 325
 - mechanisms of, at cell level, 325*t*
 - symptoms of, 331
- Hypertension, 378, 382
 - aging and, 297
 - dentists and referrals for, 376
 - dentists and screening for, 378
 - edentulism and, 301
 - periodontal disease and, 300
- Hypnosis, 75–84
 - authoritarian style of, 81–82
 - chronic pain conditions and, 135
 - clinical, brief history of, 76–77
 - culture and, 5
 - defining and use of, 78
 - for dental care-related anxiety/fear, 181, 183–184
 - dental fear reduced with, 142, 146, 147, 148, 148
 - dental pain management and, 94
 - forms of, 78–81
 - indirect suggestion, 80
 - language, 79–80
 - modeling, 81

- nontrance hypnosis, 79
 - stories, 80–81
 - trance, 78–79
- map for, 78*t*
- myths related to, 77–78
- nature of, 77
- permissive style of, 82
- recommendations for dentists, 83–84
- uses for, 82–83
- Hypnotic suggestion, relaxation training and, 53
- Hypoglycemia
 - prevention and treatment for, 331
 - symptoms of, 331
- Hypothalamic-pituitary-adrenal (HPA) axis
 - aging and decline in, 296–297
 - immune system and stress-mediated activation of, 228
 - stress and, 29, 30, 32
- IA. *See* Intraoral appliance
- IADL. *See* Instrumental activities of daily living
- IASP. *See* International Association for the Study of Pain
- Iatrosedation, reducing dental fear with, 142
- ID. *See* Intellectual disability
- IDAF-4C+. *See* Index of Dental Anxiety and Fear
- Idealism, engagement and, 369
- IgA rate, salivary flow and, 40
- IL-1, diabetes mellitus and, 325
- IL-1beta
 - diabetes mellitus and, 325
 - stress and, 30
- IL-6, 305
 - aging process and levels of, 296
 - diabetes mellitus and, 325
 - stress and, 30, 31, 32
- IL-8, stress and, 30, 32
- Illinois State Dental Society, 376
- Illinois State Medical Society, 378
- Illnesses, complexity of, 128
- Imagery
 - chronic pain conditions and, 135
 - in relaxation procedure, 390, 392, 394
 - relaxation training and, 53
 - resources, hypnosis and, 82–83
- IMIDs. *See* Immune-mediated inflammatory diseases
- Immigrants, cultural aspect of health and, 304
- Immune-mediated inflammatory diseases, stress and, 31
- Immune system
 - aging and, 296, 297
 - stress and, 29–31
- Immunodeficiency, oral risk assessment and, 307
- Immunosenescence, aging and, 296, 297
- Implementation Intention Theory, 242, 243
- Implication, hypnotic language and, 79
- Incongruity theory, humor and, 350, 351, 354
- Incongruous actions toward objects, in McGhee's stages of humor development, 352, 353*t*
- Incubation effects, dental pain and, 100
- Index of Dental Anxiety and Fear, 178
- India
 - dental care-related anxiety/fear in, 175
 - growth of elderly population in, 294
- Indirect suggestion, 80
- Infectious disease, 305
- Inflammation
 - dental aging and role of, 296
 - stress and, 27–33
- Inflammatory bowel disease, 31
- Inflammatory response
 - diabetes mellitus and, 325
 - stress and, 29–31
- Information avoiders, 271
- Information obstacles, overcoming, people with special needs and, 338, 339–340
- Information seekers, 271
- Information technology
 - cultural aspect of health and, 304
 - oral healthcare for aging population and, 312–313
- Informed consent, 184
- Injection fear, 167
- Injection time, prolonged, child disruptive behavior and, 213, 218*t*
- Institute of Medicine, 20, 339–340
- Instruction, drooling and, 252–253

- Instrumental activities of daily living, elderly population and, 294
- Insula, pain processing and, 100
- Insulin, saliva and, 45
- Insulin-dependent diabetes mellitus (IDDM) patients, toothbrushing self-efficacy in, 239
- Insulin resistance, periodontal disease and, 324–325
- Insulin therapy, for diabetic patients, 328
- Integrative interventions, for dental care-related anxiety/fear, 185–186
- Intellectual disability
 - drooling in children with, 252
 - severe/profound
 - auditory prompting for tongue protrusion in persons with, 260
 - contraindications for self-management procedures and, 257
 - microswitch-based techniques and drooling in persons with, 254, 255, 258
 - tongue protrusion in persons with, 259
 - treatment procedures for, 259–260
- Intelligence, bias in healthcare and, 373
- Interdental cleaning, diabetic patients and, 326
- International Association for the Study of Pain, pain defined by, 123
- International Consortium for TMD Research, 129
- International political agenda, elderly population and, 294
- Internet
 - cultural aspect of health and, 304
 - health communication and, 313
- Interpersonal communication, effective,
 - between providers and dental patients, 284–285
- Interpersonal communication training
 - in dental education, 285
 - evaluation of, 290
 - factors influencing design of, 285–286
 - role playing and live-patient simulation in, 286–288
 - successful, essential factors tied to, 288–290
 - case development, 289
 - faculty development and quality assurance, 289–290
 - training SPs and quality assurance, 288–289
- Interprofessional collaboration, 376
- Interruptions, as barrier to effective listening, 273
- Intraoral appliance, in treatment of TMD patients, 56
- Involving the individual technique, people with special needs and, 342
- Irrational fears, unlearning, 182
- Irritable bowel syndrome, 130
- Israel, culturally different interpretations of pain among women in labor in, 375
- Japan
 - dental care-related anxiety/fear in, 175
 - evolving faculty development in, 289–290
 - SPs in dental education in, 287
- Jargon, 271
- Jaw Functional Limitation Scale, 132
- Jaw pain
 - biofeedback-assisted relaxation training and, 50
 - sleep bruxism and, 131
- JFLS. *See* Jaw Functional Limitation Scale
- Job Demands-Resources model, 365, 365, 368, 369
- Job resources, dentists and, 368–369, 369t
- Joblessness, periodontitis and, 228
- Kareiva, Peter, 269
- Labeled praise, for dental care-related anxiety/fear, 181–182
- Lactobacillus acidophilus*, salivary levels of, 45
- Lactoferrin, saliva and, 39
- Language
 - hypnotic, 79–80
 - oral health literacy assessment and, 339
- Laptops, sEMG use, electrical interference and, 66, 67
- Laser hair removal, 110
- Lashley cup, unstimulated saliva and, 42
- Latent inhibition, 97
- Lateral cervical muscles, sEMG in assessment of, 69

- Latin America, growth of elderly population in, 294
- Laughter
- definition of, 350
 - physiological benefits of, 351
- Laughter at the attachment figure stage, in McGhee's stages of humor development, 352, 353*t*
- Laughter without humor stage, in McGhee's stages of humor development, 352, 353*t*
- Lavoisier, Antoine, 76
- Lawsuits, good listening and decrease in, 274
- Learning theory
- biofeedback and, 50
 - chronic pain behavior and, 127
- Leg length disparity, abnormal EMG patterns during mastication and, 68
- Leg-raising, 145
- Licensure in dentistry, obligation of health professionals and, 379
- Lichen planus, 326, 374
- Life expectancy, global demographics and increase in, 293
- Lifestyle
- counseling, 380–381
 - motivational interviewing and, 309
 - self-related health status and, 303
- Ligature-induced periodontitis, chronic stress and bone loss resulting from, 30
- Lipopolysaccharides, dental caries in elderly and activation of, 298
- Listening, 267–279, 284
- active, 276–277
 - barriers to, 271–273
 - in clinical dental practice, 268
 - cultural differences and, 272
 - defined, 268, 275
 - dentist's identity and, 279
 - effective, 274–279
 - enhancing, in dental practice, 279
 - facilitating responses and, 276
 - fearful patient and, 143
 - for feelings, 268
 - good, benefits of, 273–274
 - in health care, 268–271
 - hearing *vs.*, 275
 - paraphrasing and, 277–278
 - physical, 277
 - questions and, 276
 - reflection, feelings and, 278–279
 - restatement and, 277–278
 - summarizing and, 278
 - talking less and, 275
 - types of, 276–277
- Listening attitude, 268, 274, 275, 279
- Literacy, cultural aspect of health and, 304
- Lithium, saliva and, 45
- Litigation
- communication and, 270
 - in dental profession, increase in, 8
- Live models, reducing child disruptive behavior and, 214
- Live-patient simulation, interpersonal communication training and, 286
- Locus of control theory, diabetes, health behavior and, 330
- Longitudinal approach, dental care-related anxiety/fear and, 175
- Lost Art of Listening, The* (Nichols), 268
- Low-pass filtering, 66
- Lung cancer, smoking and, 305
- Lysozyme, saliva and, 39
- Machine-gun questions, 272
- Magnitude, efficacy expectations and, 238
- Male dentists, burnout levels and, 369
- Males, judgment of physical attractiveness and, 374
- Malocclusion, thumb sucking and, 196
- Malpractice complaints
- communication problems and, 270
 - good communication and reduction in, 284
- Marijuana, salivary levels and, 45
- Maslow's hierarchy of needs theory, 374
- Massachusetts Legislature, Joint Committee on Public Health, 377
- Masseter muscles
- arrows indicating orientation of muscle fibers, 59
 - bilateral muscle training and, 63
 - evaluation of biofeedback and mean levels of activity, 55–56

- Masseter muscles (continued)
 sEMG techniques and
 assessment of, 69
 recording activity of, 57
 study of, 62
 surface EMG sensors and positioning of
 contacts, 58
- Masticatory muscles
 awake bruxism and pain in, 153
 leg length disparity and functioning of, 68
 sEMG techniques and study of, 62
- Masticatory system, temporomandibular
 disorders and chronic pain in, 122
- Mastoid muscles, strip style electrode with
 contact placed over, 61
- Maternal anxiety, disruptive children and, 210
- Maternal oral-health-related self-efficacy, 241
- Matrix metalloproteinases, stress and, 30
- McGhee, Paul E., Piaget's cognitive stages of
 child development compared with
 stages of humor according to, 351–352,
 353*t*
- McGill Pain Questionnaire, 92
- MDAS. *See* Modified Dental Anxiety Scale
- Median rhomboid glossitis, diabetes mellitus
 and, 326
- Medicaid, 302
- Medical history, oral risk assessment and,
 307
- Medical home concept, dentists as oral
 physicians and, 378
- Medical humor, 358
- Medical management, people with special
 needs and, 340
- Medical nutrition therapy, for diabetic
 patients, 328
- Medical training, for dentists, 377
- Medicare
 compensation, nondental health services
 and, 379
 supplemental dental benefits and, 302
- Medications
 oral risk assessment and, 307
 sleep bruxism and, 158
- Meditation, dental fear reduced with, 142, 148
- Melanocortin-1 receptor (MC1R) gene, pain
 sensitivity and, 101
- Memory, dental pain and, 100
- Men
 awake bruxism and, 154
 dental care for elderly, limitations with
 ADLs, 302
 dental care-related anxiety/fear and, 176
 dental pain and, 102
 dental self-efficacy and, 239
 dissatisfaction with body parts, 110*t*
 sanctioning of sick roles for, 127
 temporomandibular disorders in, 122
- Mental health
 aging and, 297
 referrals, 142
 screening for, 382–383
 of young patients, orthodontists and, 380
- Mental imagery phase, in Brief Relaxation
 Procedure, 148
- Mental methods of distraction, reducing
 dental fear with, 144, 145
- Mentors, for underrepresented minority dental
 students, 7
- Mesmer, Anton, 76
- Metabolic control
 diabetes mellitus, dental caries and, 325
 diabetic patients and, 327
- Metabolic syndrome, type II diabetes and,
 324
- Metabolism, aging and, 296
- Methadone, salivary levels and, 45
- Methylphenidate, sleep bruxism and, 158
- MI. *See* Motivational interviewing
- Michigan Oral Health-Related Quality of Life
 Scale-Child Version, 15, 16*t*
- Micro-arousals, sleep bruxism and, 155–156
- Microarray chip technology, saliva function
 and, 45
- Microswitch-based techniques for drooling,
 254–256
 persons with developmental disabilities
 and, 258
- Mid-level providers, time saved for primary
 care and use of, 377
- Migrant farm workers, OHRQoL study of, 21
- Migrant populations, UN estimate of, 4
- Minority dental students, underrepresented,
 7, 8

- Misnaming objects or actions stage, in McGhee's stages of humor development, 353*t*, 354
- Missing teeth
avoidance of treatment and, 176
in migrant farm workers, 21
OHRQoL and, 22
- MMPs. *See* Matrix metalloproteinases
- Modeling, 81
for dental care-related anxiety/fear, 142, 181, 182
reducing child disruptive behavior and, 214, 218*t*, 221*t*
- Modified Dental Anxiety Scale, 143, 177
- MOHRQoL, 22
- MOHRQoL-C. *See* Michigan Oral Health-Related Quality of Life Scale-Child Version
- MOHRQoL-Parent/Proxy Version, 15, 17*t*
- Momentary time sampling, thumb sucking assessment and, 196, 197*t*, 198
- Monitoring, dental pain and, 95
- Mood disorders, awake bruxism and, 157
- Morbidity
adult social habits and, 303
diabetes mellitus and, 324
- Mortality
adult social habits and, 303
dental world and, 375
- Motivational interviewing
dental care-related anxiety/fear and, 185
in dentistry, implementation of, 245–247
developing discrepancy, 245–246
expressing empathy, 245
rolling with resistance, 246
supporting self-efficacy, 246–247
elderly patients and, phases in, 309
people with special needs and, 339
self-efficacy and, 245
- Motor abilities, children with special needs and, 220
- Mouth, self-esteem and morphology/function of, 374
- Mouth closure, drooling and, 252
- Mouth guards
alternatives to, 158–159, 160
bruxism treatment and, 158
- Mouth wiping
microswitch-based techniques and, 254
self-management of, 256
- Mowrer's two-factor theory, 97
- MP3 devices, drooling and use of, 254, 255
- MPD. *See* Myofascial pain disorder
- MPI. *See* Multidimensional Pain Inventory
- MTS. *See* Momentary time sampling
- Multicultural communication skills, 304
- Multidimensional Pain Inventory, 132–133
- Multidimensionality of health behaviors, diabetic patients, oral health and, 330
- Multimodality computer-based biofeedback systems, 70
- Multiply disabled persons, microswitch-based techniques and drooling in, 254
- Multisite *vs.* "wide" placements, sEMG recordings and, 63–64
- Muscle activation/balance at rest, biofeedback-assisted training to improve patterns of, 52
- Muscle hypotonia, tongue protrusion in individuals with, 259
- Muscles
activity in
EMG as measure of, 56–57
sEMG in assessment and, 68
frequent use of sites, in dental applications, 62–63
groups of, placement array for recording activity in, 64
recording sites, surface EMG sensors and, 57, 58
reeducation for, 69
functional, sEMG and, overview of, 49–51
sternocleidomastoid muscle and, 63
TMD disorders and, 55
relaxation training, TMD disorders and, 55
selecting for biofeedback-assisted relaxation training, 64–65
tension awareness, sEMG activity and, 54
- Muscular tissue, aging and, 296
- Musculoskeletal orofacial pain conditions, 124

- Music, 145
 dental pain management and, 94
 drooling and use of, 254, 255
 reducing child disruptive behavior with, 215, 216
- Myalgia, 124
- Myelinated A-delta fibers, pain and, 91
- Myofascial pain disorder, 50
 occlusal equilibration and, 159
 sEMG in assessment of, 68
- National Health and Nutrition Examination Survey, 14, 240
- National Institute of Dental and Craniofacial Research, 13
- Nationality, bias in healthcare and, 373
- Native Americans, traditional alternative medical models of care and, 304
- Negative reinforcement
 dental anxiety/fear and, 99, 169
 drooling and, 253
 thumb sucking and, 197, 198
- Netherlands, dental care-related anxiety/fear in, 175
- Neuroendocrine response, age-related, 296–297
- Neuromatrices, 124
- Neuropathic orofacial pain conditions, 124
- Neuroticism, 171, 172
- NHANES. *See* National Health and Nutrition Examination Survey
- Nichols, Michael, 268
- Nicotine dependence, periodontal disease and, 31
- NIDCR. *See* National Institute of Dental and Craniofacial Research
- Nitrous oxide, 185, 186, 357
- Nociception
 in biopsychosocial model for pain, 126, 126
 pain *vs.*, 125
- Nocturnal alarm systems, sleep bruxism and, 158–159, 160
- Non-computer-simulated/SP, in dentistry, 286
- Non-relaxation-based techniques
 reducing dental fear with, 142
 communication, 143–144
 distraction, 145–146
- Nonadherence, lifestyle change in elderly and, 310
- Noncommunicable disease, migrant populations and, 5
- Noncommunicable lifestyle chronic conditions, 294, 294†
- Noncompliance, high levels of, 270
- Nonconfronting stress coping style, periodontitis and, 232
- Nondental health services, compensation to dentists for, 379
- Nonmaleficence, 117
- Nontrance hypnosis, 79
- Noradrenalin, stress and secretion of, 228
- Norepinephrine, nicotine and release of, 32
- Notch filter set, 66
- Nursery study, on oral health behavior, 244–245
- Nutrition. *See also* Diet
 dentists and referrals for, 376
 oral risk assessment and, 307
 oral-systemic disease risk factors in elderly and, 305
- Obesity
 lifestyle counseling and, 380, 381
 oral risk assessment and, 307
 periodontitis and, 380
- Objective structured clinical examination, 286, 287, 288, 290
- Observational learning, dental care-related anxiety/fear and, 171
- Occlusal disharmonies, sleep bruxism and, 156
- Occlusal equilibration, sleep bruxism and, 159
- Occupational stress, periodontitis and, 228
- Occupational therapy, 364
- Octogenarians, population growth of, 294
- OHF. *See* Oral health fatalism
- OHIP. *See* Oral Health Impact Profile
- OHIP-14, 14, 22
- OHL. *See* Oral health literacy
- OHRQoL. *See* Oral health-related quality of life
- Online health information, 313
- Open bay concept, modeling, reducing child disruptive behavior and, 214, 221†

- Open-ended questions, 276
- Operant conditioning, dental fear/anxiety and, 169
- Opiates, salivary levels and, 45
- OPPERA study, 135
- Optic microswitch, drooling and use of, 254–255
- Oral appliances, for thumb sucking, 199
- Oral bacterial toxins, systemic subclinical inflammation and, 299
- Oral Behaviors Checklist, 131
- Oral cancer, 6
 - aging and, 301
 - in Asian populations, 5
 - edentulous patients and, 312
 - risk assessment in elderly and, 307
 - risk model for, 301
 - salivary biomarkers for, 45
- Oral contraceptives, oral ecosystem and, 298
- Oral diseases
 - aging and, 297–298
 - diabetes mellitus and, 323, 324–326
- Oral functioning, oral health-related quality of life and, 12
- Oral health
 - health inequalities and, 5, 6
 - poor, avoidance of treatment and, 176
 - saliva and, 42
- Oral health behavior and status
 - dental self-efficacy in, 239–240
 - improving, interventions in, 241–245
 - sources of, 240–241
 - diabetic patients and, 326–327
- Oral health care
 - aging process and, 295
 - elderly population and, summary requirements for, 313
 - fear of aspects of, 167
- Oral Health Care Plan, 345–346
- Oral health disparities, quality of life research on, 19
- Oral health exchange programs, 8
- Oral health fatalism, 241
- Oral Health Impact Profile, 14
- Oral health literacy, self-efficacy and, 240
- Oral health obstacles, overcoming, people with special needs and, 338–339
- Oral health-related quality of life, 11–23, 308
 - analysis of the status quo, 20–22
 - challenge of human adaptation, 21
 - need for differentiation, 22
 - as powerful communication tool, 20–21
 - assessment of, 14–15, 16*t*, 17, 17*t*
 - behavioral scientists and, 22
 - clinical practice and, 19–20
 - dental/dental hygiene education and, 20
 - global self-ratings of, 14
 - overview of, 12, 12–14
 - role in research, 17–19
 - social indicators of, 14
- Oral healthcare providers, dental pain and communication with, 93–94
- Oral hygiene. *See also* Prevention-focused oral health plan for elderly
 - neglect of, stress and, 31, 32, 228
 - short lessons on, 339
 - xerostomia and, 308
- Oral injections, fear of, 167
- Oral leukoplakia, diabetes mellitus and, 326
- Oral microbiome, 297
- Oral-motor treatment, for tongue protrusion, 259–260
- Oral pain, 90
- Oral physicians
 - deterrents to dentists becoming, 379
 - factors facilitating dentists as, 376–379
 - comfort with role in primary care, 378–379
 - compensation for nondental health services and, 379
 - medical and surgical training of dentists, 377
 - more dental rather than physician visits and, 378
 - new subordinate designation and, 377
 - obligation of health professionals and, 379
 - public acceptance of, 377–378
 - shortage of access to lower cost dental care and PCPs, 377
 - time saved for primary care by using mid-level providers, 377
 - training and, 378
 - use of mid-level providers, 377
 - role of dentists as

- Oral physicians (continued)
 access to dental care and, 375–376
 background studies, 373–374
 mental health and behavioral screening, 382–383
 overview, 373
 in physical and mental health, 373–383
 primary prevention: lifestyle counseling, 380–381
 secondary prevention: early diagnosis and treatment, 381–382
- Oral risk assessment
 aging and, 305–308
 for oral disease in elderly, 307–308
 patient counseling and principles of, 307
- Oral sex, oral transmission of HPV and, 383
- Oral surgery patients, dental pain and, 100
- Oral-systemic disease risk factors, common
 behavioral, elderly and, 305
- Oral-systemic health literacy, elderly and, 304
- Oral-systemic risk assessment
 intervention strategies and, 305
 self-rated, for older adults with chronic conditions, 306*t*
- Organ function, aging and, 296
- Organizational obstacles, overcoming, people with special needs and, 338–339, 343–344
- Origins of Intelligence in Children* (Piaget), 374
- Orofacial area, changes in, as social stressor, 374
- Orofacial pain, 90, 102. *See also* Chronic orofacial pain
 dual-axis approach to assessment of, 128–129, 129
- Oropharyngeal cancer, 301
 xerostomia management in patients with, 41
- Orthodontic appointments, quality of life for adolescent patients and, 19
- Orthodontics, pain with, 90
- Orthodontists, as oral physicians, 380
- Orthognathic surgery, guidelines in working with patients seeking, 116
- OSCE. *See* Objective structured clinical examination
- Osteoporosis
 dentists and referrals for, 376
 periodontal disease and, 300, 307
 physical inactivity and, 305
- Outcome expectancy, defined, 238
- Ovarian cancer, salivary biomarkers for, 45
- Overcoming Obstacles to Oral Health: A Training Program for Caregivers of People with Disabilities and Frail Elders*, 338
- Overcorrection procedure
 drooling and, 253
 tongue protrusion and, 259
- Overjets, sleep bruxism and, 156
- Overseas student exchanges, 8
- Paan consumption, oral cancer in Asian populations and, 5
- Paced breathing, for dental care-related anxiety/fear, 142, 145, 146, 148, 182
- Pacific Islanders, traditional alternative medical models of care and, 304
- Pacifiers, 197, 200
- Pain. *See also* Chronic orofacial pain; Dental pain
 adolescent orthodontic patients and, 19
 atypical odontalgia, 91
 biobehavioral assessment of dental patients with, 129–130, 134–136
 biomedical views of, 125
 chronic, 91
 definition for, 90
 IASP definition of, 123
 nociception *vs.*, 125
 oral health-related quality of life and, 12
 orofacial, 102
 perception of, ethnocultural differences in, 375
 subjective experience of, 123, 125
 ubiquity of, 90
 verbal descriptions of, 92
- Pain and treatment history, 130–131
- Pain-related factors, dental care-related anxiety/fear and, 173
- Pain Sensitivity Index, 99

- Palatal plate therapy, for tongue protrusion, 261
- Pandemic and All-Hazards Preparedness Reauthorization Act, 376
- Panic
- chronic orofacial pain and, 132
 - dental pain and, 96
- Panic attacks, in dental clinic, predispositions to, 167
- Parafunctional jaw behaviors, TMD-related orofacial chronic pain and, 131
- Paraphrasing, 143, 268, 277–278
- Parasomnia, 155
- Parasympathetic nervous system,
- diaphragmatic breathing and, 145
- Parasympathetic salivary stimulation, 38
- Parenting style, disruptive children and, studies of, 211
- Parents, in operatory, child disruptive behavior and, 213–214, 218*t*, 221*t*
- Parotid glands, 38
- eating disorders and, 382
 - xerostomia and swelling in, 326
- Parotid-sparing radiotherapy, for head and neck cancer patients, 18
- Partial participation, positioning, use of tongue blade mouth prop and, 340–341, 341, 342
- Passive-aggressive patient behaviors, modulating, good listening and, 274
- Passive distraction activities, reducing child disruptive behavior with, 216
- Passive emotion-oriented coping strategies, 230
- Passive stress coping strategy, stress, periodontitis and, 233
- Patient-directed approach, elderly and, 309–310
- Patient satisfaction, factors tied to, 269
- Patients
- culture and management of, 4–6
 - understanding through good communication, 284
 - values of, 274
- Peak-to-peak quantification, EMG activity, 65
- Peck, Scott, 275
- Pediatric dentistry
- stress in, 349–350
 - use of humor in, 349–360
 - examination, 356–357
 - general benefits for, 355
 - pre-examination: first encounter and meeting the patient, 355–356
 - stress and, 357–359
 - treatment, 357
- Pediatric dentists
- educational and practice culture of, 212–213
 - as oral physicians, 380
- Pediatric oral health education, 244
- People with special needs
- Daily Mouth Care Plan for, 345–346
 - effective oral health program for, 344
 - oral health promotion with, 337–347
 - creating plan for, 344
 - overcoming behavioral obstacles, 342–343
 - overcoming information obstacles, 339–340
 - overcoming oral health obstacles, 338–339
 - overcoming organizational obstacles, 343–344
 - overcoming physical obstacles, 340–342
 - unique challenges for, 338
- Perceived control, dental pain management and, 96
- Perception, in biopsychosocial model for pain, 126, 127
- Performance anxiety, biofeedback signal and, 53
- Performance attainment, self-efficacy and, 238
- Performance evaluation, for interpersonal communication training, 286
- Periodic limb movements, sleep bruxism and, 154
- Periodontal disease
- aging and, 297, 298–300
 - coping with stress and influence on, 229–231
 - dental plaque with biofilm structure and, 326
 - diabetes mellitus and, 323, 324, 325, 327
 - OHRQoL indicators and, 22
 - reducing, antiseptic and antimicrobial rinses for, 312
 - risk assessment in elderly and, 307

- Periodontal disease (continued)
 risk model for, 300
 salivary gland hypofunction and, 42
 smoking and, 31, 305
 stress and, 30
 epidemiological and clinical findings, 28–29
 systemic disease and, 307
Periodontal patients, self-efficacy scales for, 239–240
Periodontal surgery, pain with, 90
Periodontal therapy
 coping with stress and influence on, 231–233
 diabetic patients and, 332
Periodontal treatment, type I *vs.* type II diabetes and, 325
Periodontists, as oral physicians, 380
Periodontitis
 chronic psychological stress and pathogenesis of, 32
 as hyperinflammatory condition, 29
 risk factors tied to, 227–228
 stress coping behavior of patients with, 230–231
 systemic disease and, 380
Periodontitis patients, self-efficacy and six-step oral self-care for, 243–244
Permissive style of hypnosis, 82
Peroxidase, salivary, 39
Person-environment fit, burnout and, 369–370
Personal behaviors, listening and, 272
Personality, dental care-related anxiety/fear and, 172–173
Pets, reducing child disruptive behavior with, 216
pH, salivary, 39
Phantom limb pain, 125
Phantom tooth pain, 90, 374
Pharmacological interventions, for dental care-related anxiety/fear, 185–186
Phobias
 dental, 5
 hypnosis and, 83
Phosphate buffer system, saliva and, 39
Photoelectric plethysmography, 70
Physical abuse, chronic TMD pain and, 134, 136. *See also* Domestic violence
Physical appearance
 concerns about, psychological assessment of patients with, 115, 116*t*
 happiness in life and, 109–110
 perception of, ethnocultural differences in, 375
Physical attractiveness, personal and professional success and, 374
Physical inactivity
 chronic diseases and, 305
 periodontitis and, 228
Physical listening, 268, 277
Physical methods of distraction, reducing dental fear with, 145
Physical obstacles, overcoming, people with special needs and, 338, 340–342
Physical status, chronic pain and assessment of, 132
Physicians, dentists seen more frequently than, 378
Physiological assessment,, of dental care-related fear and anxiety, 179–180
Piaget, Jean, 374
Piaget's cognitive stages of child development, McGhee's stages of humor development *vs.*, 351–352, 353*t*
Pilocarpine hydrochloride, 45
Pittsburgh Sleep Quality Inventory, 133
Plaque
 dental caries in elderly patients and, 298
 reducing, antiseptic and antimicrobial rinses for, 312
 self-efficacy and control of, 242
Plastic surgery, 111, 117
Playing with words stage, in McGhee's stages of humor development, 353*t*, 354
Politeness, patient satisfaction and, 284
Polymorphonuclear leukocyte function, diabetes mellitus and, 325
Polypharmacy, 40, 307
Polysomnography, sleep bruxism and, 157, 160
Population-based behavioral intervention, for elderly population, 308–309

- Positioning, partial participation, tongue blade mouth prop and, 340–341, 341, 342
- Positive engagement, 366
- Positive psychology of work, 366
- Positive reinforcement
- biofeedback and, 53, 56
 - dental fear/anxiety and, 169
 - drooling and, 252–253
 - thumb sucking and, 197, 198
- Positive suggestions, relaxation training with patient and, 389–390
- Postdoctoral programs, ADA accreditation for, 376
- Posttraumatic stress disorder
- chronic TMD pain and, 134, 136
 - salivary cortisol changes and, 374
- Posture
- dysfunction in, craniomandibular syndrome and, 68
 - physical listening and, 277
- Posturographic techniques, 68
- PPG. *See* Photoelectric plethysmography
- Praise, reducing child disruptive behavior with, 216–217
- Pre-gelled electrodes, 60, 62
- Preamplified sensors
- advantages with, 67
 - with “dry” recording capability, 61
 - EMG systems, 58
 - working with, 60
- Predictability, dental pain and, 94–96
- Prefrontal cortex, pain processing and, 100
- Preoperational thought: egocentric, in Piaget’s cognitive stages of child development, 353*t*
- Preoperational thought: intuitive, in Piaget’s cognitive stages of child development, 353*t*
- Prescription fluoride, 311
- Pressure microswitches, drooling and use of, 255
- Preterm delivery, periodontitis and, 380
- Prevention
- primary: lifestyle counseling, 380–381
 - secondary: early diagnosis and treatment, 381–382
- Prevention-focused oral health plan for elderly, 310–312
- antiseptic and antimicrobial rinses, 312
 - assistance with oral hygiene, 311–312
 - counseling, 312
 - developing and tailoring, 311
 - edentulism, 312
 - fluoride exposure, 311
 - xerostomia, 312
- PreviDent, 311
- Primary care
- dentists comfortable with role in, 378–379
 - functions in, present and proposed, 381*t*
 - screening, dental practices and, 380
- Primary prevention, lifestyle counseling, 380–381
- Primary somatosensory cortex, pain processing and, 100
- PRIME-MD project, 131
- Privileges, reducing child disruptive behavior with, 216–217
- Problem solving, as barrier to effective listening, 273
- Professional expectations, realistic, burnout prevention and, 371
- Progesterone, saliva and, 45
- Progressive muscle relaxation, 53
- dental fear reduced with, 142, 146, 147, 148
- Progressive relaxation in dental office
- preparation before, 389–391
 - script for, 391–395
- Proinflammatory cytokines, dental caries in elderly and activation of, 298
- Prompting, drooling and, 252–253
- Propranolol, sleep bruxism and use of, 159
- Protease inhibitors, xerostomia and, 41
- Protection Motivation Theory, self-efficacy and, 240
- Protein buffer system, saliva and, 39
- PSI. *See* Pain Sensitivity Index
- Psoriasis, 31
- Psychiatric disorders, pediatric dentists and recognizing early signs of, 380
- Psychoactive agents, side effects of, 382

- Psychoeducation
 - caring for ill/disabled older adults and, 313
 - for dental care-related anxiety/fear, 181, 184–185, 186
- Psychological and psychosocial factors in pain patients
 - assessing, 129–132
 - pain and treatment history, 130–131
 - parafunctional jaw behaviors, 131
- Psychological assessment, of patients with appearance concerns, 115, 116*t*
- Psychological distress, awake bruxism and, 157
- Psychological-psychiatric support, referrals for, 234
- Psychological status, chronic pain and assessment of, 131–132
- Psychological well-being, oral health-related quality of life and, 12
- Psychosocial factors, dental disease and, 5
- Psychosocial status, chronic pain and assessment of, 132
- Psychosocial work characteristics, categories of, 365
- Psychotropic medications, xerostomia and, 338
- Psychotropic stimulants, stress, periodontitis and, 232
- Pterygoid muscles, sEMG techniques and study of, 62
- PTSD. *See* Posttraumatic stress disorder
- PTSD Checklist, 134
- Public health dentists, as oral physicians, 380
- Pyramid training program, people with special needs and, 339
- QoL. *See* Quality of life
- Quadriplegia, severe spastic, self-management for drooling and adolescent boy with, 256
- Quality assurance
 - faculty development and, 289–290
 - training SPs and, 288–289
- Quality care, reflecting on meaning of, 19
- Quality of life. *See also* Oral health-related quality of life
 - cosmetic dental interventions and effect on, 111–112, 117
 - edentulism and, 300
 - noncommunicable lifestyle chronic conditions and, 294
 - oral health, 308
 - salivary gland hypofunction and, 41–42
 - self-image and, 111
 - successful aging and, 295
- Quasi-relaxation techniques, guided imagery, 146
- Questions, listening and, 276
- Race/ethnicity, 373
 - dental student population and, 7
 - elderly healthcare and, 303–304
 - oral health literacy assessment and, 339
 - oral risk assessment and, 307
- Radiation therapy, salivary changes and, 41
- Radio frequency waves, 57
- Randomized controlled trials, 242
- Rapport, 275, 277
 - with children, 356
 - relaxation training with patient and, 389, 391
- Rapport phase, in Brief Relaxation Procedure, 148
- RCTs. *See* Randomized controlled trials
- RDC/TMD. *See* Research Diagnostic Criteria for Temporomandibular Disorders
- RDC/TMD Validation Project, 128
- “Reasonable care” standards, behavior management procedures and, 212
- Reasoned action theory
 - diabetes, health behavior and, 330
 - self-efficacy and, 240
- Reference contact, placement of, 58, 59
- Referred muscle pain, 64
- Reflection, 268
- Reflective listening, 143
 - motivational interviewing and, 245, 309
- Rehearsal, dental fear reduced with, 148
- Rehearsing, as barrier to effective listening, 272
- Reinforcement of good behavior, reducing child disruptive behavior with, 216–217, 218*t*

- Reinforcers, people with special needs and use of, 343
- Relaxation
- burnout prevention and, 371
 - chronic pain conditions and, 135, 136
 - for dental care-related anxiety/fear, 142, 146–149, 181, 182
 - diaphragmatic breathing and, 145
 - health benefits with, 391
 - hypnosis and, 82
 - methods, somatic and cognitive orientation of, 148
- Relaxation phase, in Brief Relaxation Procedure, 148
- Relaxation training
- biofeedback-assisted, issues to consider with, 53
 - efficacy of combining biofeedback with, for TMD patients, 55, 56
 - procedure
 - brief, for use in dentistry, 389–395
 - script for, 391–395
 - “wide” placement and, 63
- Relief theory, humor and, 350–351
- Remote contingencies, thumb sucking and, 204
- Repression-sensitization stress concept, 231
- Research, oral health-related quality of life and, 17–19
- Research Diagnostic Criteria for Temporomandibular Disorders, 123, 128–129, 130*t*, 136
- testing reliability and validity of Axis I and II of, 128–129, 129
- Resignation, coping with stress and, 229
- Resistance, rolling with, motivational interviewing in dentistry and, 246
- Resistin, stress and, 31
- Resources and demands, work stress and, 364, 365
- Response cost, thumb sucking and, 201
- Response desynchrony, 144
- Restatement, 268, 277–278
- Rett syndrome, bruxism and, 158
- Revised Dental Beliefs Survey, 178
- Reward systems, people with special needs and use of, 343
- Rheumatoid arthritis, 31
- Rhinoplasty, body dysmorphic disorder and, 114
- Rhythmic masticatory muscle activity, 155, 156, 157
- Rice test, 38
- Riddles and jokes stage, in McGhee’s stages of humor development, 353*t*, 354–355
- Risk assessment, elderly patient and prevention-focused oral health plan based upon, 310–312
- RMMA. *See* Rhythmic masticatory muscle activity
- Role induction, 275–276
- Role playing, interpersonal communication training and, 286
- Root canal therapy
- dental fear and, 166
 - misinformation about, 184
 - social learning and, 171
- Root caries, in elderly, 307
- Root mean square (RMS) quantification, 65
- Roter, Debra, 269, 270, 271
- Rumination, coping with stress and, 229
- Salagen, 45
- Saliva, 374
- chewing and, 308
 - clinical significance of, 42–45
 - stimulated saliva, 43–45
 - unstimulated saliva, 42–43
 - complications with hypofunction in, 41–42, 42*t*
 - current diagnostic values and future directions for changes in, 45
 - dysfunction in, 39–41
 - formation of, 38–39
 - functions of, 39, 39*t*
 - oral health and, 297–298
 - public and health professionals’ image of, 38
 - xerostomia and protein composition of, 326
- Salivary flow rate, 44–45

- Salivary function, stress and, 31
- Salivary glands
 - evaluating function of, 42
 - hypofunction in
 - chronic conditions associated with, 40*t*
 - clinical and radiographic evidence of dental caries, dry lips, and tongue in patient with, 43
 - identifying patients with or at risk for, 44
 - management of patients with, 45
 - signs and symptoms of, 41–42, 42*t*
 - xerogenic medications and, 40, 41
 - types of, 38
- Salivary output, preserving, in head and neck cancer patients, 18
- SARS. *See* Severe acute respiratory syndrome
- SBI. *See* Sulcus bleeding index
- SC-OHE. *See* Structured comprehensive pediatric oral health education
- Scarification, 375
- Schizophrenia, recognizing signs/symptoms of, 382
- School children, physical attractiveness and, 109
- SCL-90, 131
- Scope of practice, broadening of, 379–380
- Screening
 - dentists as oral physicians and, 378–379
 - present and proposed primary care functions and, 381*t*
 - preventive, for systemic disease, 380
- SCT. *See* Social Cognitive Theory
- Seasonal migration, of elderly population, 303
- Seattle System, dental care-related anxiety/fear and, 175
- Secondary prevention, early diagnosis and treatment in, 381–382
- Secondary somatosensory cortex, pain processing and, 100
- Sedation, 100, 185, 186, 212
- Sedentary lifestyles, oral-systemic disease risk factors in elderly and, 305
- Selective serotonin reuptake inhibitors, 117, 382
- Self-care
 - active, defined, 328
 - diabetic patients and, 326, 327–329
 - fear related to, 167
 - technological advancements and, 312–313
- Self-efficacy. *See also* Dental self-efficacy
 - defined, 238
 - diabetes, health behavior and, 329–330
 - dimensions of, 238
 - elderly and, 310
 - in health and health behavior, 238–239
 - interventions in, to improve oral health behavior, 241–245
 - motivational interviewing and, 245, 246–247
 - other health behavior theories and, 240
 - scales, 239
 - for maternal oral care, 241
 - sources of, 238
- Self-esteem
 - diabetes, health behavior and, 330
 - morphology and function of mouth and, 374
 - self-rated health and, 305
- Self-hypnosis, training in, 184
- Self-image, 111, 117
- Self-improvement, listening and, 279
- Self-management
 - defined, 328
 - elderly and, 309–310
 - over swallowing and drooling, 256, 257
- Self-monitoring, tongue protrusion and, 259
- Self-pity, coping with stress and, 229
- Self-regulation approaches, for awake bruxism, 159, 160
- Self-report assessments, dental anxiety/fear and, 177–179
- Self-worth, 111
- sEMG. *See* Surface electromyography
- sEMG biofeedback treatment, for TMD, efficacy evaluations of, 55–56
- sEMG instrumentation
 - selecting, considerations for, 65–67
 - computer-based systems, 65–66
 - frequency range, 66
 - laptops and electrical interference, 66
 - summary points on, 66–67
- Sensation monitoring, dental pain and, 95
- Sense of humor, 350
- Sensor attachment, summary points on, 62
- Sensor placement, with surface EMG sensors, 57–58

- Sensor toothbrushes, 312
- Sensorimotor development, in Piaget's cognitive stages of child development, 352, 354
- Sensory-discriminative component, of pain, 100
- Sensory qualities, of pain experience, 127
- Separation anxiety, 213
- Serotonin, nicotine and, 32
- Serotonin reuptake inhibitors, sleep bruxism and, 158
- SES. *See* Socioeconomic status
- Seventh Day Adventists, hypnosis prohibited by, 77
- Severe acute respiratory syndrome, salivary biomarkers for, 45
- Sexual trauma
chronic TMD pain and, 134, 136
dental care-related anxiety and, 170
- SF-FPQ. *See* Short Form of the Fear of Pain Questionnaire
- Shaping procedures, people with special needs and use of, 343
- Short Form of the Fear of Pain Questionnaire, 179
- Sialadenosis, bulimia nervosa and, 40
- Sick role, biopsychosocial model for pain and, 127
- Signals, reducing dental fear with, 145
- Silver/silver chloride electrodes, electrical resistance of, 60
- Simulated patients
in dental education, history behind, 287
SPs *vs.*, 286
- Situational Type of Specific Phobia, independent of BII Type, 167
- Sjögren's syndrome
in animal model, gene therapy in management of, 45
dry mouth and, 41
- Skeletal open bite, 132
- Skin cancer, dentists and referrals for, 376
- Skin conductance, 70
- Skin preparation, sEMG sensors and, 60–62
- Skin resistance, 70
- Sleep apnea, sleep bruxism and, 154, 155
- Sleep bruxism, 131, 160
cascade of physiological events in, 156
characteristics of, 153
diagnosis of, 157–158
electromyographic trace of rhythmic masticatory muscle activity during, 157
prevalence of, 154
risk factors for, 154
severe tooth wear in, 155, 155
- Sleep dentistry, 185
- Sleep disturbance, chronic pain and, 133
- Sleep hygiene, 133
- Sleep polysomnography, sleep bruxism and, 157
- Smart pillbox, 312
- Smoking. *See also* Tobacco use
diabetes and, 324, 326
lifestyle counseling and, 380, 381
oral cancer and, 301
oral ecosystem and, 298
oral risk assessment and, 307
oral-systemic disease risk factors in elderly and, 305
periodontitis and, 228
sleep bruxism and, 154
stress and
increased levels of IL-8, 30
periodontitis, 232–233
synergistic effects of, 31–33
- Smoking cessation programs
dentists and referrals for, 376
diabetic patients and, 328, 332
elderly and, 310
self-efficacy and, 239
- Snoring, sleep bruxism and, 154
- Social approval, for treatment of tongue protrusion, 260
- Social cognitive theory, 239, 242
- Social communities, healthy aging and, 302–303
- Social learning, dental fear/anxiety and, 170–171
- Social modeling, dental pain and, 93
- Social networks
caring for ill/disabled older adults and, 313
new generation of elders and, 303
- Social praise, for dental care-related anxiety/fear, 181

- Social reinforcement, thumb sucking and, 197
- Social responsibility, 4, 7
- Social skills, burnout prevention and, 371
- Social stigma, people with special needs and, 338
- Social stressors, orofacial area and, 374
- Social support
dental pain and, 93–94
self-rated health and, 305
- Social well-being, oral health-related quality of life and, 12
- Social withdrawal, coping with stress and, 229
- Society for Clinical and Experimental Hypnosis, 147
- Sociodemographic factors, dental care-related anxiety/fear and, 173
- Socioeconomic status
dental care-related anxiety/fear and, 176
dental pain and, 101, 102
edentulism and, 300
oral health literacy assessment and, 339
overload HPA and, 297
self-related health status and, 303
- Somatic anxiety, 147, 148
- Somatization, chronic pain and screening assessment for, 131
- Somatoform disorders
awake bruxism and, 157
pain and, 90
- SP methodology, benefits of, 287–288
- Spa dentistry, 81
- Spatial qualities, of pain experience, 127
- Special needs population. *See* People with special needs
- Special Supplemental Nutrition Program for Women, Infants, and Children, 240
- Specific Dental Care-Related Phobia, 167
- Specific Phobia, Situational Type, 186
- Specific Phobia of dental care, 167
- Spinal pain, overutilization of health system and, 375
- Splints
bruxism treatment and, 153, 158
thumb sucking and, 199
- Spousal loss, severe periodontal disease and, 29
- SPs
main roles for, 288
in medical and dental education, background history for, 286–287
training, quality assurance and, 288–289
- SSRIs. *See* Selective serotonin reuptake inhibitors
- “Standards of Medical Care in Diabetes–2012,” 328
- Stereotypes, ethnocultural differences in pain perception and, 375
- Sternocleidomastoid (SCM) muscle
electrode spacing and, 60
sEMG activity and assessment of, 69
sEMG techniques and study of, 63
strip style electrode placement over, with reference in middle position, 61
surface EMG sensors and positioning of contacts, 58
- Stimulants, 382
- Stimulus control, for dental care-related anxiety/fear, 181
- Stoicism, 375
- Stories, hypnosis and, 80–81
- Stravinsky, Igor, 268
- Strength, efficacy expectations and, 238
- Streptococcus mutans*, salivary levels of, 45
- Stress
acute, 29
aging and, 296, 297
bruxism and, 154
burnout prevention measures and, 371
caring for ill/disabled older adults and, 313
defined, 28
dental pain and, 96
dental students and, 370
dentistry and, 349
dry mouth and, 40
effects on immune system and inflammatory response, 29–31
hyperinflammatory effects of, 31
immune system, emergence of disease and, 233
inflammation and, 27–33
oral ecosystem and, 298
oral hygiene and, 31, 32

- oral-systemic disease risk factors in elderly and, 305
- periodontal disease and, 228
 - epidemiological and clinical findings, 28–29
 - limitations of studies on, 29
- sleep bruxism and, 156
- smoking and, 31–33
- work and, 364
- Stress coping
 - extracted factors after factor analysis, 230
 - strategies, evaluating in periodontitis patients, 234
 - studies on, 228–233
 - influence on periodontal disease, 229–231
 - influence on periodontal therapy, 231–233
- Stress-coping questionnaire, 229, 232
- Stress inoculation
 - dental fear reduced with, 142, 148
 - training, for dental care-related anxiety/fear, 181
- Stress management
 - biofeedback-assisted relaxation training within context of, 52
 - jaw pain and, 50
- Stress reduction, diabetic patient and, 331
- Strip-style electrodes, 59
 - with contact placed over mastoid, 61
- Stroke, diet, ethnic diversity and, 6
- Structured comprehensive pediatric oral health education, 244
- Structuring the environment technique, people with special needs and, 342
- Students, OHRQoL interviews and, 21
- Sublingual salivary glands, 38
- Submandibular salivary glands, 38
- Substance abuse, chronic pain and, 133
- Substitute gratification, stress, periodontitis and, 232, 233
- Successful aging, factors related to, 295
- Sucrose-restricted diet, lower caries prevalence and, 326
- Sugar in diet, dental caries and, 326
- Suggestion phase, in Brief Relaxation Procedure, 148
- Suggestions, as barrier to effective listening, 273
- Suicide attempts, reporting, dentists as oral physicians and, 380
- Sulcus bleeding index, 31
- Summarizing, 268, 278
- Superiority theory, humor and, 350, 351
- Surface electromyography, 49
 - in assessment, 67–70
 - biofeedback
 - in assessment and functional muscle reeducation, 49–71
 - in clinical practice, 52–55
 - dental relevant applications with, 51–52
 - efficacy evaluations of, in treatment of TMD disorders, 55–56
 - historical development of, 51
 - overview, 49–51
- instrumentation, selecting, 65–67
 - frequency range, 66
 - laptops and electrical interference, 66
 - summary, 66–67
- measurement of muscle activity and, 57
- sensors and recording techniques, 57–62
 - electrode spacing, 60
 - preamplified sensors, 58
 - sensor placement, 57–58
 - skin preparation, 60–62
 - types of electrodes, 58–60
- techniques
 - in assessment, 67–70
 - muscle sites used in dental applications, 62–64, 64
 - selecting muscles for training, 64–65
- Surgical training, for dentists, 377
- Swallowing
 - cueing techniques for, guidelines for clinical use of, 258
 - drooling and, 252, 253
 - self-management of, 256
- Sweden, dental care-related anxiety/fear in, 175
- Sympathetic salivary stimulation, 38–39
- Sympathomimetic actions, xerogenic potential with, 40
- Systematic desensitization, for dental care-related anxiety/fear, 142, 146, 147, 148, 148, 181, 182

- Systemic disease
 - aging and, 297
 - preventive screening for, 380
- Taste aversion, sleep bruxism and use of, 159
- Teach-back, 304
- Teachers and teaching staff
 - culturally diverse, need for, 6–8
 - OHRQoL interviews and, 21
- Technology
 - dental pain management and, 94
 - oral healthcare for aging population and, 312–313
- Teeth, dissatisfaction with, 110, 110*t*
- Telephone-delivered health information, 313
- Television viewing, reducing child disruptive behavior with, 215, 216
- Tell-Show-Do technique, 182, 215, 357
- Temporal qualities, of pain experience, 127
- Temporalis muscles
 - large circular patch cut down with scissors to fit over, 61
 - sEMG activity and assessment of, 69
 - sEMG sensors and positioning of contacts, 58
 - sEMG techniques and study of, 62
- Temporomandibular disorders, 50, 122
 - awake bruxism and, 154, 155
 - biobehavioral interventions for, 135
 - biofeedback-assisted relaxation training
 - within context of stress management/emotional reactivity training for, 52
 - in children, OHRQoL and, 21
 - craniofacial and perioral structures involved in, 122
 - efficacy evaluations of biofeedback in treatment of, 55–56
 - guidelines for biobehavioral assessment data and management of, 134–136
 - recommended measures for core biobehavioral constructs associated with, 130*t*
 - salivary cortisol levels and, 305
 - sEMG and cases of, 51–52
 - sEMG in assessment of patients with, 67–70
 - stress and, 374
 - thumb sucking and, 196
- Temporomandibular joint, 122
- Temporomandibular joint disorder, 122
- Temporomandibular joint (TMJ) patients
 - domains of psychological and psychosocial assessment for, 130–134, 136
 - efficacy evaluations of biofeedback in treatment for, 55
- Temporomandibular pain, psychosocial factors and, 5
- Tension, sleep bruxism and, 156
- Tension release, dental professionals and, 357–359
- Theophylline, saliva and, 45
- Theory of Planned Behavior, self-efficacy and, 240
- Thermal biofeedback, 70
- Third-party payers, compensation, nondental health services and, 379
- Thompson, Kay, 77
- Thought stopping, dental fear reduced with, 148
- 360-degree approach, in interpersonal communication training, 290
- Thumb sucking, 195–204
 - antecedent intervention, 199–200
 - response covariation, 200
 - response prevention, 199
 - assessment of, 196–197
 - combination interventions, 202–203
 - consequent interventions, 200–202
 - aversive taste treatment, 201–202
 - response cost, 201
 - extinction of, without social consequence, 198
 - functional assessment of, 197–198
 - malocclusion and, 196
 - prevalence of, 195
 - summary and recommendations for future research on, 203–204
 - treatment for, 198–203
- Time management, burnout prevention and, 371
- Tissue engineering, 18
- TMDs. *See* Temporomandibular disorders
- TMJ. *See* Temporomandibular joint
- TMJD. *See* Temporomandibular joint disorder
- TNF. *See* Tumor necrosis factor

- Tobacco cessation programs, 379
 periodontal team and counseling about, 233
 promoting, 33
- Tobacco use. *See also* Smoking
 in elderly, assessing, 311
 oral cancer and, 301
 salivary levels and, 45
- Token rewards, drooling and, 253, 257
- Tongue blade mouth prop, positioning and, 341, 341, 342
- Tongue fissures, diabetes mellitus and, 326
- Tongue protrusion
 behavioral treatment procedures, guidelines
 for clinical use of, 261
 critical examination of experimental
 methodology for, 260–261
 definition, prevalence, and cause, 259
 treatment procedures for, 259–260
 summary of, 261
- Tooth contact, chronic, awake bruxism and, 154
- Tooth damage, preventing, splints and, 158
- Tooth fractures, sleep bruxism and, 155
- Tooth loss, aging and, 297
- Tooth pulp, pain from, 91
- Tooth pulp shock, 95
- Tooth wear, bruxism and, 154–155, 155
- Tooth whitening, body dysmorphic disorder
 and requests for, 113, 114
- Toothache, 90
 words describing pain with, 92
- Toothbrushes
 adaptations for easier grip, 340, 340
 for someone with limited dexterity, 340, 340
- Toothbrushing
 diabetic patients and, 326, 328
 elderly and assistance with, 311
 flossing and
 dental self-efficacy and, 239
 reasoned action theory and, 240
 Implementation Intention Theory and, 243
 partial participation techniques and, 341, 341, 342
- Tourism, elderly and, 303
- Training. *See also* Interpersonal communication
 training; Relaxation training
 of oral physicians, 378
- Trance, 76, 78
 deep, 78
 description of, 78–79
 heavy *vs.* light, 79
 hypnosis *vs.*, 77
- Transitional objects, thumb sucking and, 200
- Transportation, for elderly, dental care access
 and, 303
- Transtheoretical Model, self-efficacy and, 240
- Trapezius muscles
 groups of, sEMG in assessment of, 69
 upper
 placement of electrode contacts on, 61
 sEMG activity and assessment of, 69
 sEMG sensors and positioning of contacts, 58
 sEMG techniques and study of, 63
- Traumatic conditioning, 170
- Travel, elderly and, 303
- Treadmill walker, profile of, 368
- Treating an object as a different object stage, in
 McGhee's stages of humor
 development, 352, 353*t*
- Treatment-seeking patterns, dental care-related
 fear/anxiety and impact on, and
 relation to associated variables, 174
- Treats, reducing child disruptive behavior
 with, 216–217
- Tricyclics, 382
- Trigeminal neuralgia, 124
- Trustworthiness, 277
- TSD. *See* Tell-Show-Do technique
- Tumor necrosis factor, aging process and
 levels of, 296
- Tumor necrosis factor-alpha
 diabetes mellitus and, 325
 insulin resistance, obesity and elevated
 levels of, 300
 oral bacterial toxins and elevated levels of, 299
 stress and, 31, 32
- Twain, Mark, 268
- Twin studies, on bruxism, 154
- Two-factor theory of learning, dental care-related
 fear/anxiety and, 169
- Type A personality, sleep bruxism and, 154

- UCS. *See* Unconditioned stimulus
- Ultraviolet radiation, oral cancer and, 301
- Unconditioned stimulus, 97
- Uncovering, hypnosis and, 83
- Unemployment, 364
- Unidimensionality of health behaviors,
 - diabetic patients, oral health and, 330
- United Kingdom, dentists as oral physicians in, 378
- United States, growth of elderly population in, 294
- University of Louisville, 376
- University of Oregon, 376
- Unmyelinated C-fibers, pain and, 91

- Values, patient, 274
- Vasodilation training, 70
- Vasovagal syncope, 167
- Verbal persuasion, self-efficacy and, 238
- Verbal report assessment, of dental care-related fear/anxiety, 177–179
- Veterans, interventions in self-efficacy and improved oral health behavior in, 242
- Vicarious experience, self-efficacy and, 238
- Video eyewear, reducing child disruptive behavior with, 216, 221*t*
- Video games, 145
 - reducing child disruptive behavior with, 215, 216
- Video models, reducing child disruptive behavior and, 214
- Videotapes, for interpersonal communication training, 285
- Vigor, work engagement and, 366
- Virtual reality, 94, 145
- Vision deficits, in elderly, dental care and, 302–303, 312
- Vitamin D deficiency, periodontal disease and, 300
- Voice control technique, for disruptive children, 215

- Volume conduction, 63
- Volunteer work, 8

- Water fluoridation, decline in edentulous rates and, 300
- “Wide” *vs.* multisite placements, sEMG recordings and, 63–64
- Wiping mouth and chin
 - drooling and, 253
 - self-management of, 256
- Wisdom tooth surgery, 375
- Women
 - awake bruxism and, 154
 - dental care for elderly, limitations with ADLs, 302
 - dental care-related anxiety/fear and, 176
 - dental pain and, 102
 - dental self-efficacy and, 239
 - dissatisfaction with body parts, 110*t*
 - sanctioning of sick roles for, 127
 - temporomandibular disorders in, 122
- Work
 - positive psychology of, 366
 - stress and, 364
- Work engagement, defined, 366
- World Health Organization, health defined by, 13
- Wright, Robin, 269

- Xerostomia (dry mouth), 307–308, 311, 312
 - chronic conditions associated with, 40*t*
 - diabetes and, 324, 326, 332
 - people with special needs and, 338
 - signs and symptoms of, 41–42, 42*t*
 - social stressors and, 374
- Xerostomia-Related Quality of Life Scale, 14
- Xylitol products, preventing dental caries with, 326

- YouTube, dentists’ videos on, 359